

GRIP Tropical Forecast Discussion for September 20, 2010

Created 1600 UTC September 20, 2010

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Summary: The GRIP domain has some activity today, and GRIP and PREDICT are focusing their attention on PGI-46L. The system's convection seems more widespread and slightly better organized today than yesterday. The dust to the north of the system continues to be advected along with PGI-46L, and will be present over the Caribbean tomorrow when GRIP is able to fly an investigative mission into the interactions between the two. This will be the DC-8's third deployment to St. Croix for the field program. PREDICT is currently flying the system and will fly again tomorrow and Wednesday leaving at 1200 UTC each day with about 6 hour long flights. The DC-8 will take off at 1600 UTC Tuesday and Wednesday to investigate PGI-46L and the dust, as well as underflying a CALIPSO satellite pass in the eastern Caribbean near the targets.

Forecast for 1600 UTC 9/20/2010:

Synoptic Overview:

The western portion of the Atlantic basin is not highly active, but there are a few features of note (**S1**). At the surface, a trough near the coast of Texas that has been providing numerous showers and thunderstorms to the western Gulf of Mexico continues to reside in the same location today as yesterday. The convection there today is a bit more intense and organized compared to yesterday as well (**S2, S3**). Some of this convection extends east as far as 85W. The rest of the Gulf is fairly inactive under the influence of an upper level ridge (**C1**) and high wind shear in the eastern Gulf (**C2**). Dry air at low (**S4**) and mid- to upper levels (**S6**) prevails across the eastern Gulf as well. The only deep convection in the Caribbean is to the east, where moisture and a shortwave surface trough have been pulled north out of the ITCZ by the low level influence of Hurricane Igor to the north. This moisture at low levels being pulled north by Igor can clearly be seen in TPW imagery (**S4**). At upper levels, there is also a moisture maximum (**S6**) in this area and upper level winds (**C1**) show it being drawn into both Igor and wrapping around a mid-Atlantic upper level ridge. This ridge is associated with a dust maximum from a SAL outbreak that is evidenced by both visible satellite imagery (**S2**) as well as TERRA and AQUA overpass composites of AOD (**S5**). Wind shear across the Caribbean is generally low, as well as in a belt between 10N and 18N that extends from the Caribbean across to the East Atlantic (**C2, C8**), but elsewhere in the central Atlantic shear is very high. Dry air accompanies this area at low levels, in between PGI-46L and PGI-45L, and to the north of it (**S4**).

A pair of cold level lows, one over Spain, the other west of the UK, dominate the upper level flow over Africa (**C7**). The combined influence of the lows is responsible for the strong upper level westerlies north of 20N over the Atlantic and N Africa. Wind shear is unsurprisingly high north of 20N due to the influence of these westerlies, however it decreases abruptly along a zonal line near 20N (**C8**). To the south, tropical

easterlies dominate the upper and lower level flows (**C7 and C5**). A combination of outflow associated with the ITCZ and strong easterlies are responsible for a second zonal strip of moderate wind shear, south of 10N. However, shear is low in the gap between the easterly and easterly maximums, and it is within this minimal strip that AL94 has begun to organize.

METEOSAT imagery (**C7**) indicates that AL94's convection has increased over the past 24 hours, and the movement of the invest has been negligible. Convection associated with PGI-47L has emerged over the Atlantic, though it is displaced somewhat from the low level vorticity center (**C6**). Low level vorticity also indicates the next African wave, still east of the Prime Meridian. There is also convection with this wave, and it too is displaced slightly to the west.

Features of Interest:

PGI-45L/ AL94:

AL94 remains tantalizingly close to developing a circular, closed circulation. ASCAT passes at 0000 UTC and 1200 UTC show a broad circulation, however it is somewhat broken near the center in the SE quadrant (**45A**). Convection has been persistent over AL94, and is centered close to the low level center of circulation (**S2**). Shear remains low over the center of AL94, however a large shear gradient associated with upper level troughiness is still located just to the north (**45B and C2**). TPW is high near the center of the pouch (**S4**), but a 0400 UTC AIRS overpass indicated the presence of mid to upper level dry air to the north and west (**45C**). SSTs may also become an issue, as SSTs are merely 26C along the projected path of AL94. However, SSTs are warmer to the west, and any westward deviation from that track would increase SST values it encounters by as much as 2C.

Unfortunately for AL94, substantial westward movement appears unlikely, at least in the near term. The breakdown of the subtropical ridge by the remnants of Igor and Julia will effectively stall AL94 for the next several days. After this, there is a large degree of uncertainty in the track for 94L. There is some disagreement in how quickly the ridge will build back in, and how strong that building will be. Furthermore, the intensity of AL94 will be a factor, as a stronger storm will be more heavily influenced by upper level steering features (**45B**). Essentially, a stronger storm should take a more northeasterly track, while a weaker one will initially stall, then turn westward (**45D**). Given the moderately favorable environment, substantial intensification does not seem likely, and the westward propagation of a weak tropical cyclone is forecasted after 72 hours. After this time, SSTs and shear should become more favorable, and more substantial strengthening will be possible.

PGI-46L:

Although the initial location is dependent on which model one is looking at, PGI-46L is, in general, located near 56W/11N. The convective situation has been improving as a broad area of deep convection initiated overnight near the pouch and wave trough (perhaps a little east of the low-level wave trough) (**46A**). The 850 hPa relative vorticity (**C4**), as has been observed the previous few days, is mostly an elongated east-west vorticity maximum, as expected in the ITCZ. The center latitude of the vorticity

maximum is 11N. The CIMSS low-level cloud track winds also show a low-level trough centered near 58W, while an upper-level trough (**C1**) is centered just to the west at 61W. The deep layer wind shear is low; on the order of 5-10kt (**C2**).

One of the interesting characteristics of this wave is the high dust loading associated with a SAL to the north of the wave (see the visible image, **D1** which shows the milky appearance to the dust). The dust is propagating westward with the wave (**C10**). The GEOS-5 forecast for 1800UTC 21 September indicates the dust west of the Antilles (**D2, D3**) and north of the Dominican on 22 September (**D2, D3**). The location on 22 September may allow some sampling on transit home from St. Croix and PGI-46L.

The GFS 20/0000UTC initialization track forecast is as follows: 20/1200UTC: 57W/13N; 21/0000UTC: 60W/13N; 21/1200UTC: 64.5W/13N; 22/0000UTC: 66.0W/13.5N; 22/1200UTC: 70W/13.5N; 23/0000UTC: 72.5W/13.5N; 23/1200UTC: 75.5W/13.5N; 24/0000UTC: 78.0W/14.0N; 24/1200UTC: 83W/14.7N; 25/0000UTC: 85.0W/15.5N.

The ECMWF 20/0000UTC initialization track forecast is as follows: 20/1200UTC: 58W/13N; 21/0000UTC: 60.0W/12.5N; 21/1200UTC: 66W/14.5N; 22/0000UTC: 67W/13.5N; 22/1200UTC: 71W/14N; 23/0000UTC: 75.0W/15.5N.

The consensus track forecast for the pouch is as follows (**46B**): initial: 58.8W/12.8N; 21/0100UTC: 61.1W/12.2N; 21/1300UTC: 65.0W/12.8N; 22/0100UTC: 66.1W/12.9N; 22/1300UTC: 69.8W/13.2N; 23/0100UTC: 72.4W/13.7N; 23/1300UTC: 74.3W/13.2N; 24/0100UTC: 77.8W/14.1N 24/1300UTC: 81.6W/14.3N.

The GFS forecast indicates potential closed low development in the Caribbean Sea with some pouch intensification later in the forecast period (**46C**); however, no genesis is expected. Other models do not indicate any intensification. Overall, the disturbance has more convection, remains a weak wave and elongated vorticity and the potential for genesis remains very low.

PGI-47L:

The tropical wave with pouch PGI-47L that has been tracked across west Africa for the last several days is located along 16W south of 17N this morning, with a 1009 hPa surface low analyzed near 15N 17W at 0600UTC (**S1**). Scattered convection is located along and southeast of the wave axis, which is due to both light easterly shear of 10-15 knots and the presence of a lower TPW airmass to the north of the low (**47A, S4**). This convection is being enhanced by good upper-level divergence and elongated area of low-level vorticity maximum generally behind and east of the wave axis (**47B**).

While low-level steering currents have been guiding 47L westward at about 10 knots for the last 24 hours (**C9**), much weaker steering currents await as it nears the western periphery of a subtropical high over Saharan Africa, which should slow its forward motion to 5 knots or less today. As an upper-level trough axis digs south along 25W through Wednesday (**47C**), southwesterly shear will increase dramatically over the vorticity maximum. At the same time, a dry, dusty airmass will be pulled south and ingested into the wave at lower- and mid-levels (**C10**). Together, this will result in gradual weakening of 47L as it moves slowly northwest through mid-week, with dissipation likely by 72 hours. Models are in good agreement on this scenario, with the only open question being whether some remnant vorticity from 47L is absorbed into the northeastern flank of 45L on Thursday.

East Pacific Invest 96E/remnants of Karl:

Cyclic convection now located near 20N/108W (**96E1**) has become more organized in the last few days and there is definitely a low-level circulation (**96E6**) in ASCAT imagery. Microwave imagery (**96E2**) depicts some developing banding features and areas of heavier rain west of the center, associated with the latest convective burst. Increasing organization supports higher probabilities of genesis (50% from NHC and 81% based on Dvorak analyses). As reflected in NHC discussion, the greatest caveat to further organization is the progressively colder SSTs into which 96E is moving (**96E3**). Both persistence and current model tracks (**96E4**) indicate continued advancement towards a position near or just west of Baja California in about 48 hours, signaling upcoming weakening. Despite the current favorable environment and a north bias to model initialization, only a narrow window exists for genesis of 96E before it enters inhospitable SSTs. Nearly every model indicates weakening, with most showing dissipation by 72 hours (**96E5**).

SAL/Dust:

The Atlantic Basin has a couple of areas with high concentrations of dust. The first is north of 20N just off the coast of NW Africa. The second is on the north side of PGI-45L's circulation. The third, most important dust area for GRIP operations is (**D1**) a huge swath extending from just south of Julia's circulation around 30N between 40W and 50W diagonally down to the furthest western longitude at 62W/17N just to the north of the convection associated with PGI-46L, and then back east between 12-16N to around 42W. This area of dust has extremely high AOD values; as much as 400 PPB at 850 hPa and 350 PPB at 700 hPa in the maximum western extend of the dust layer. This dust area is interacting with PGI-46L's northernmost convection, and it will be interesting to see what the DC-8's LASE and LARGE instruments find on the upcoming mission tomorrow from 1600 UTC through 0200 UTC.

The diagrams below indicate the forecast for the motion and concentration of the dust in the western Atlantic/eastern Caribbean at 700 hPa (**D2**) and 850 hPa (**D3**). The dust appears to be more concentrated at 850 hPa (D3A) than at 700 hPa (D2A), which is typical of dust that makes it to these longitudes. The 700 hPa dust forecast (D2B-D) indicates that over the next 42 hours (from 0600 UTC today) the dust maxima that could be reached by the DC-8 is going to be located as far west as Puerto Rico and as far south as the Windward Islands near 12N. At 850 hPa, the dust will be more highly concentrated over the 42 hour forecast, and will be slightly further west than at 700 hPa, and have more interaction with the wave's forecasted circulation center.

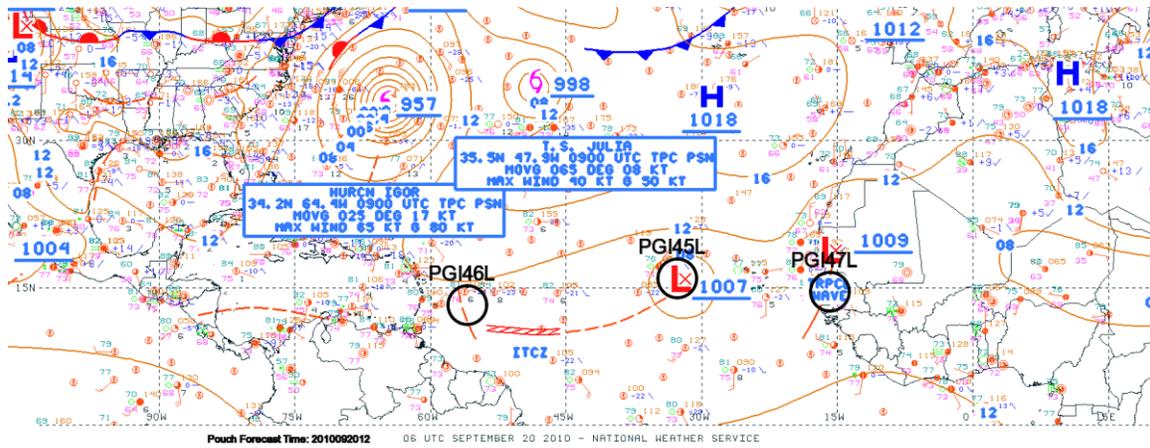
Wind forecast at 700 and 850 for tomorrow in the region where the DC-8 flight will be underflying the CALIPSO satellite: Easterlies of 15-20 kts in the flyable dust region at 700 hPa (**D4**) and up to 25 kt easterlies at 850 hPa (**D5**).

Forecasters: Albers-English, Zawislak, Zelinsky, Cossuth, Truchelut

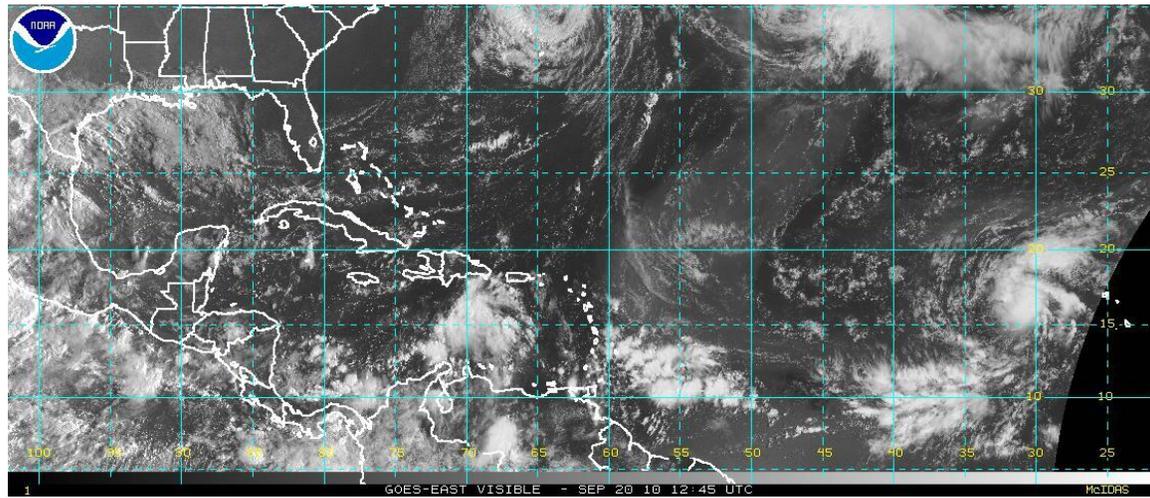
Images used in discussion:

Synoptic Overview Images

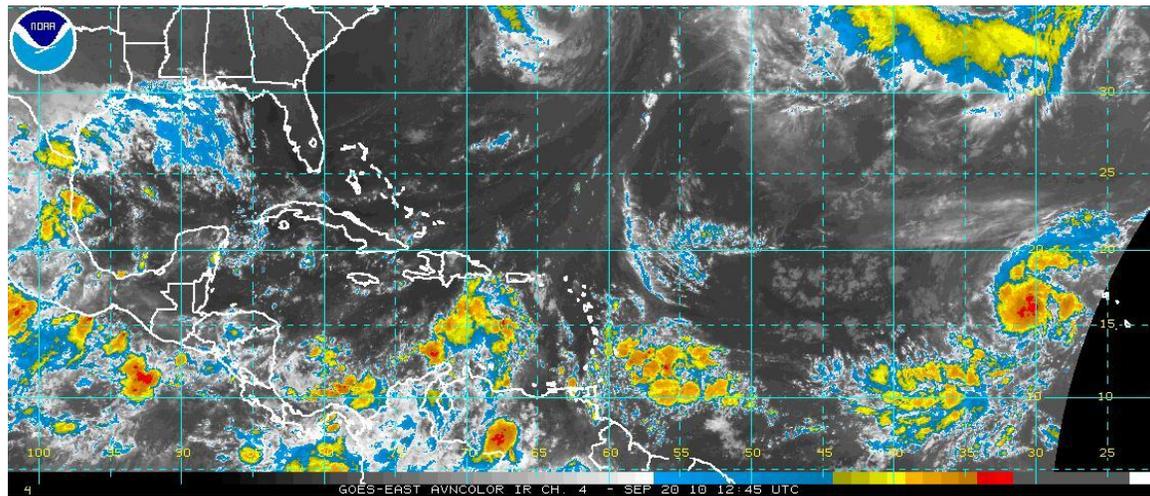
S1



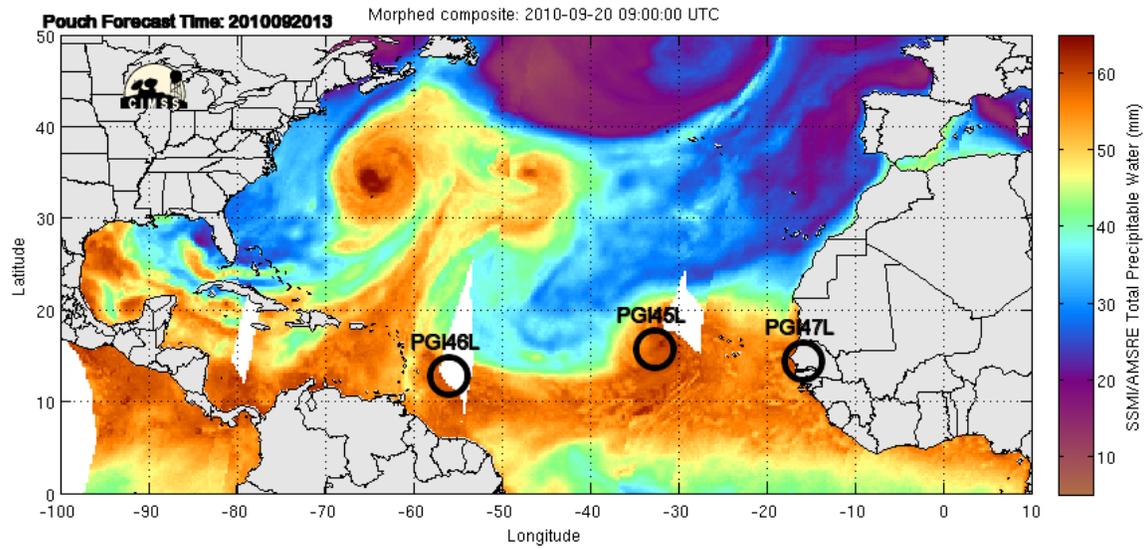
S2- GOES VIS



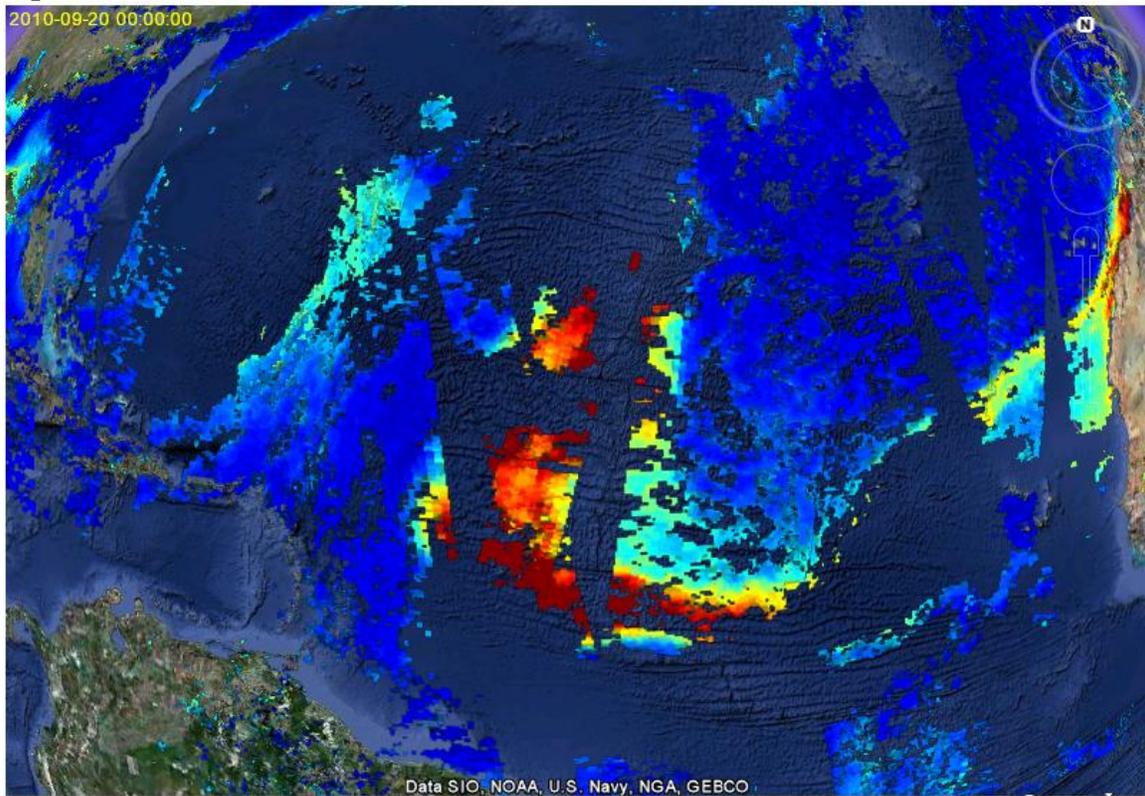
S3- GOES IR



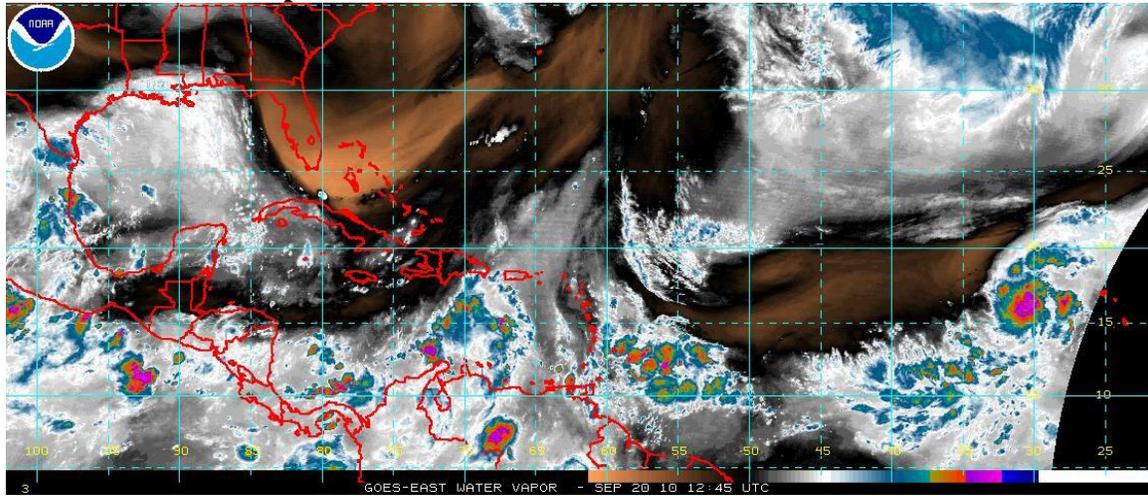
S4- CIMSS TPW with Pouch Positions



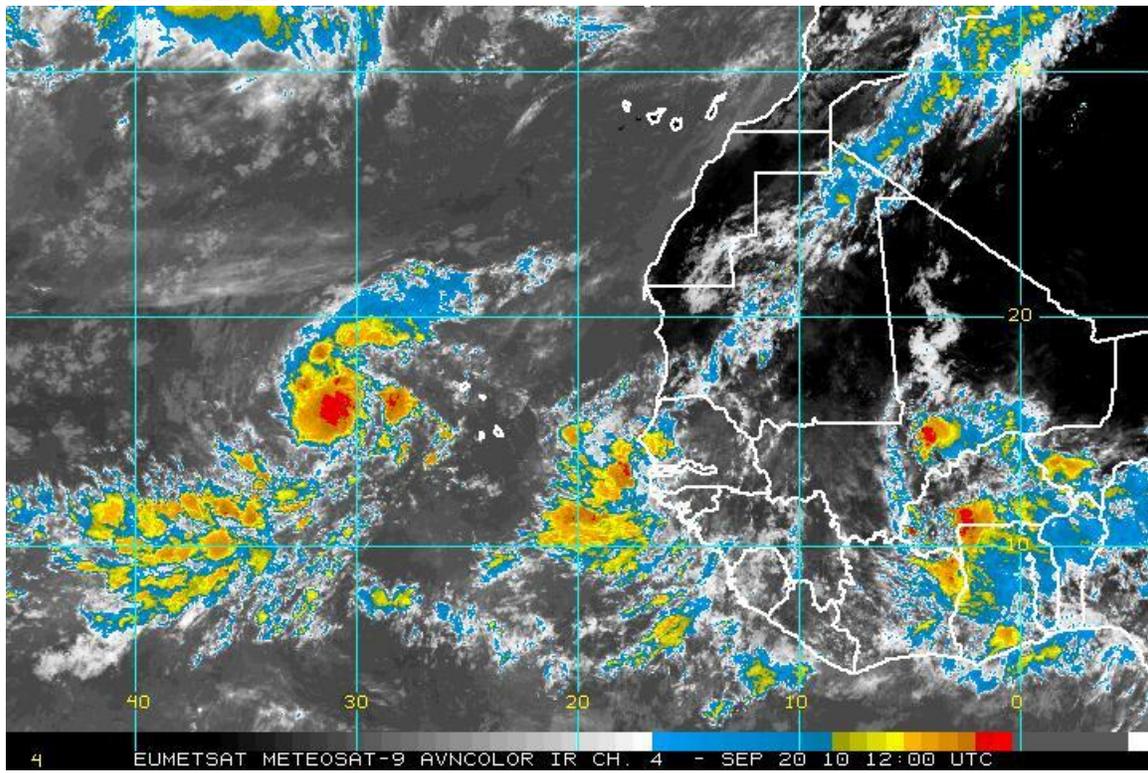
S5- AOT from AQUA + Terra via the JPL GRIP support site ending 0000 UTC September 20:



S6- GOES Water Vapor:

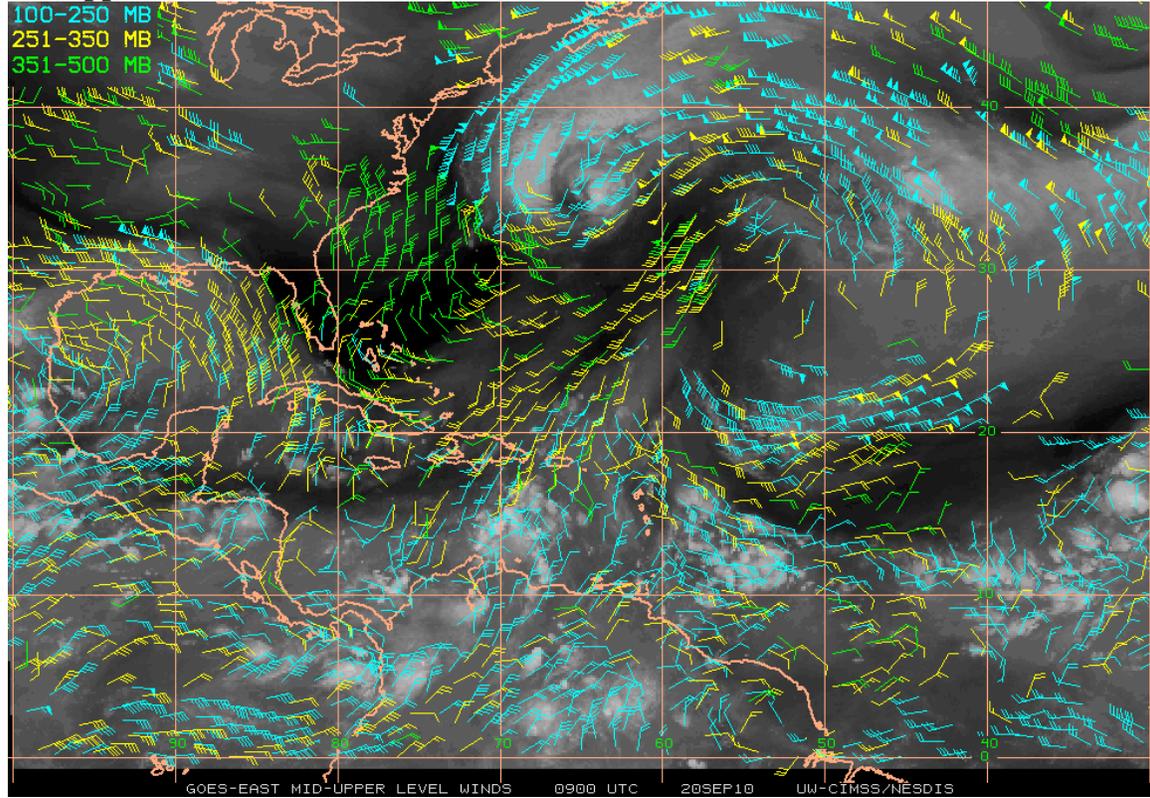


S7- METEOSAT IR

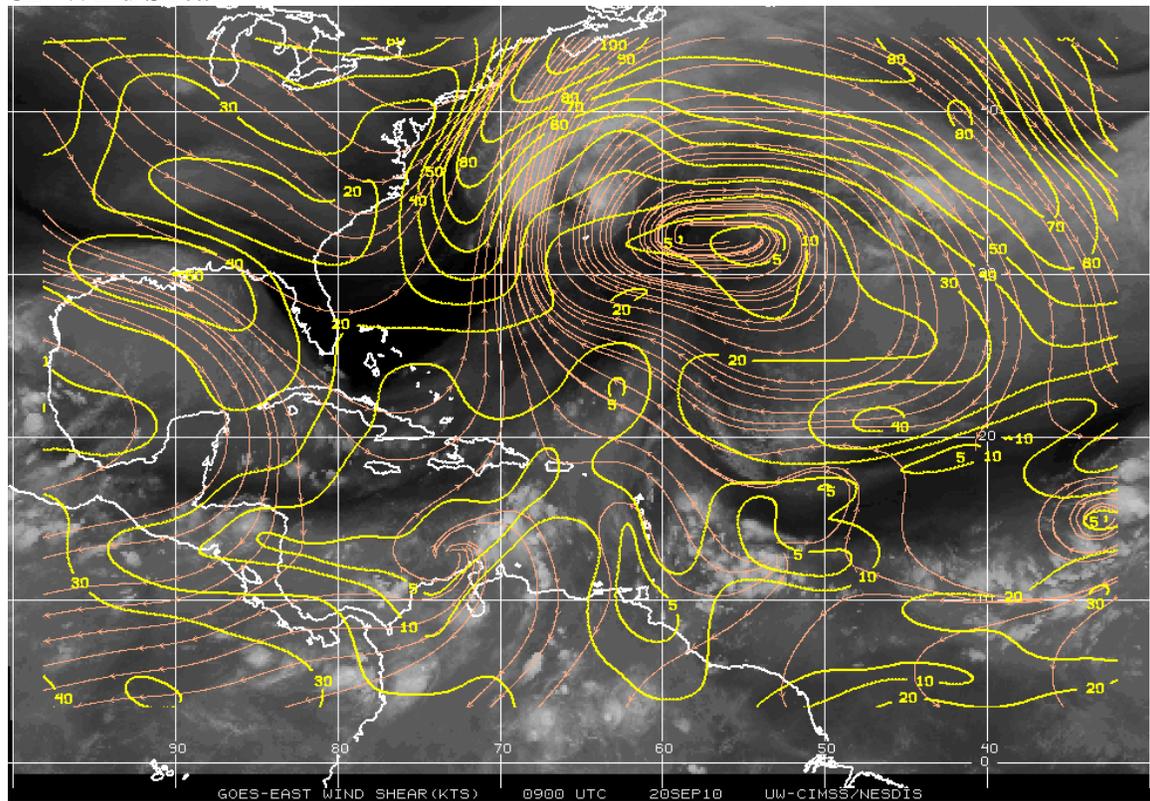


CIMSS Analyses:

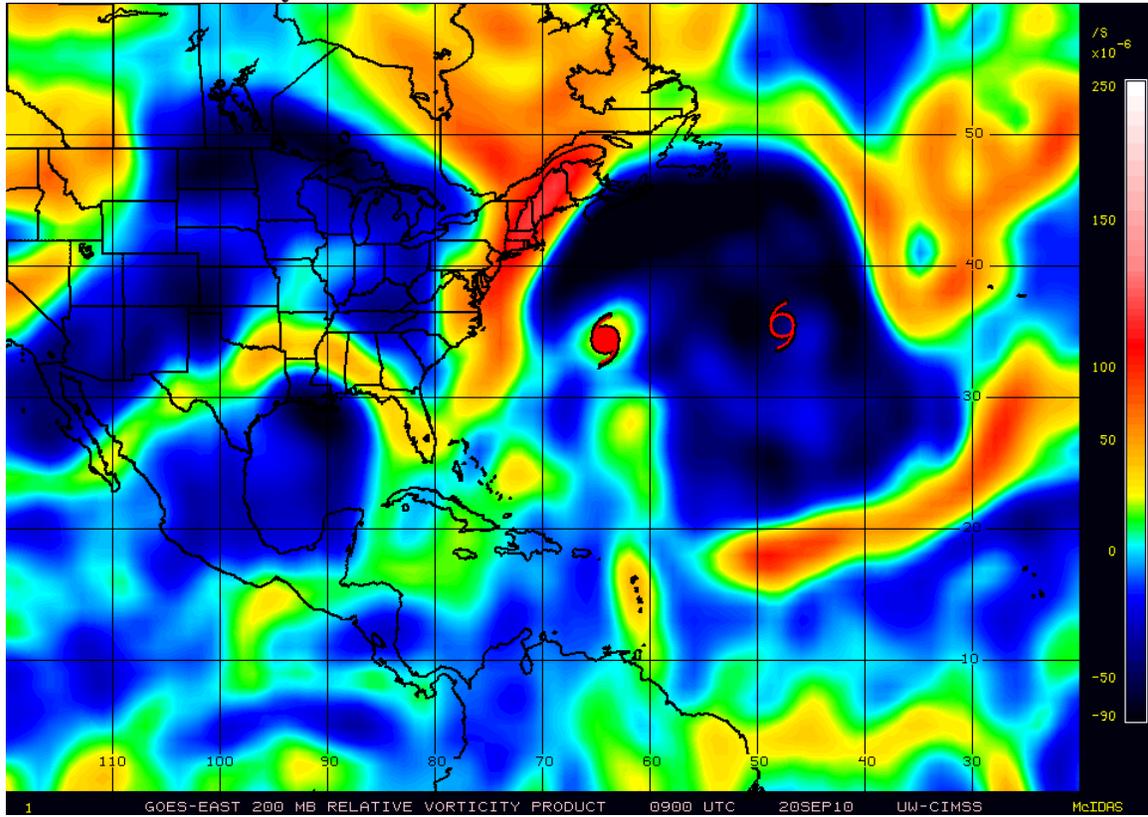
C1- Upper Level Winds



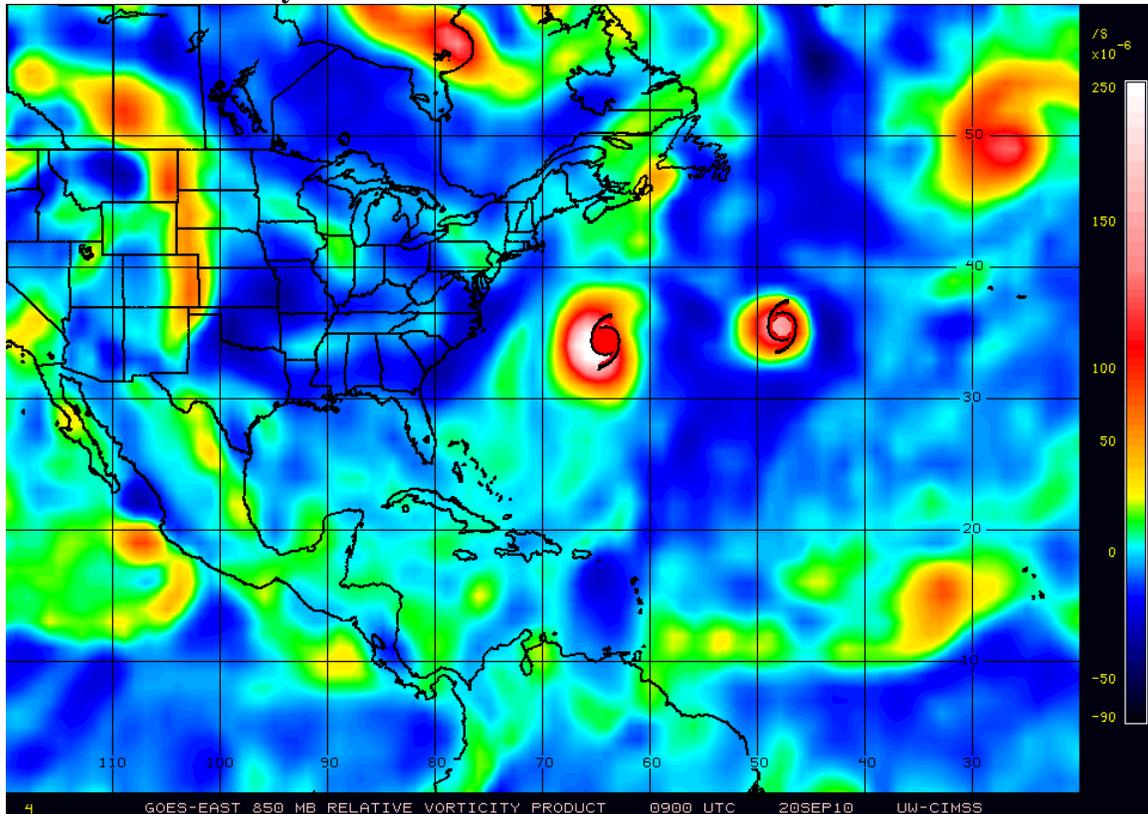
C2- Wind Shear



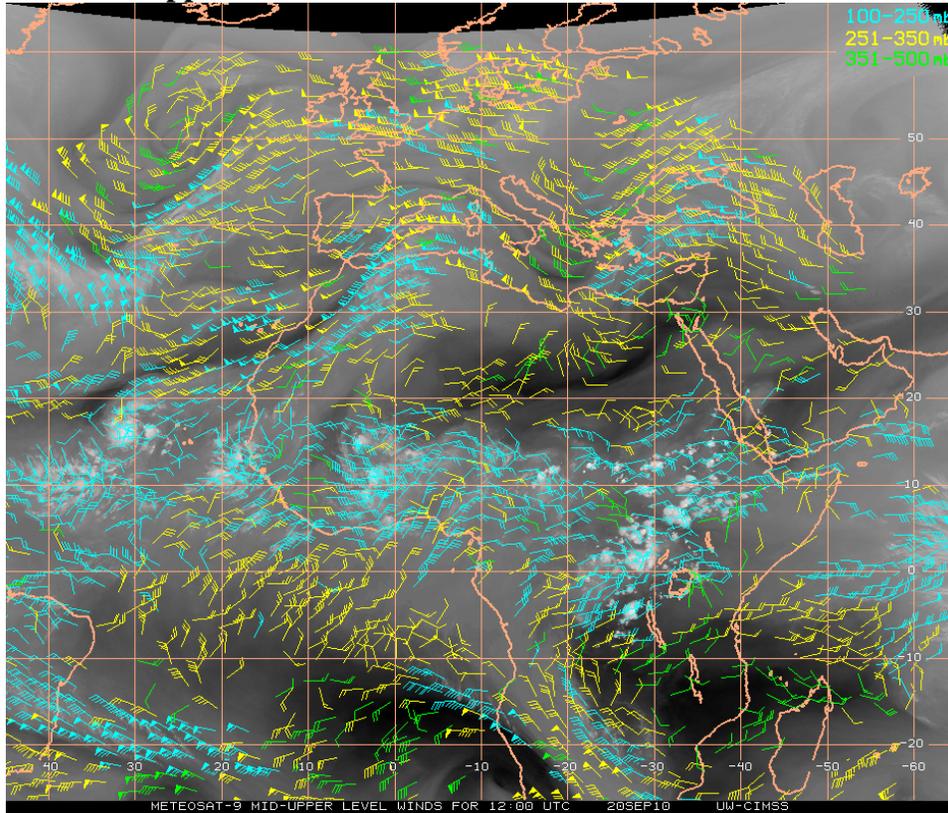
C3- 200 hPa Vorticity



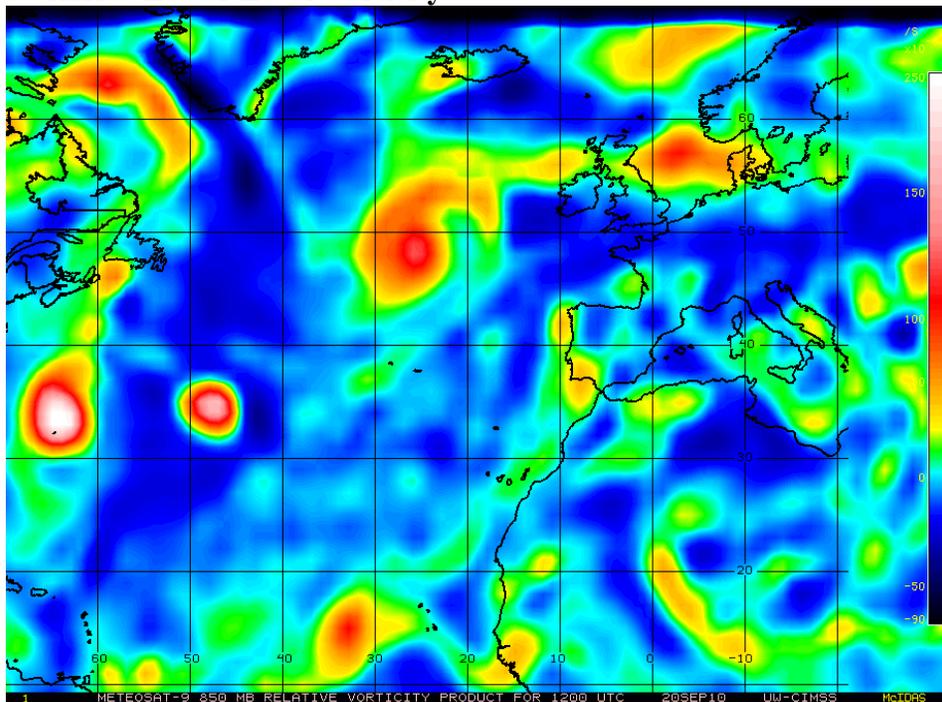
C4- 850 hPa Vorticity



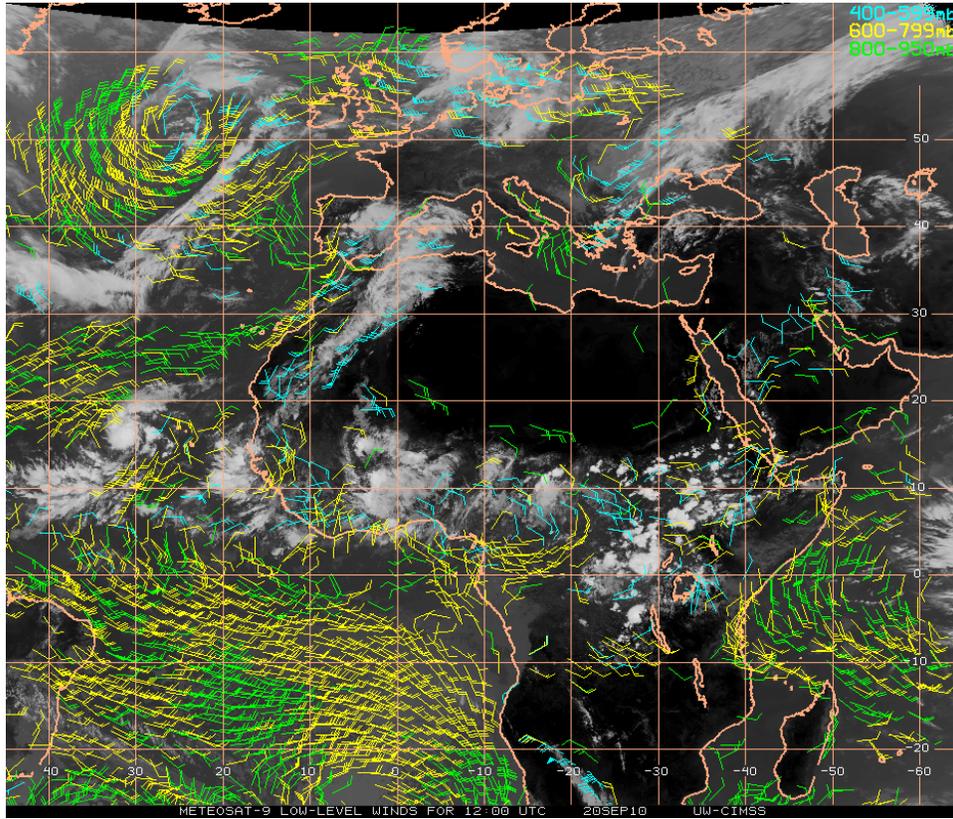
C5 Africa Upper Level Winds:



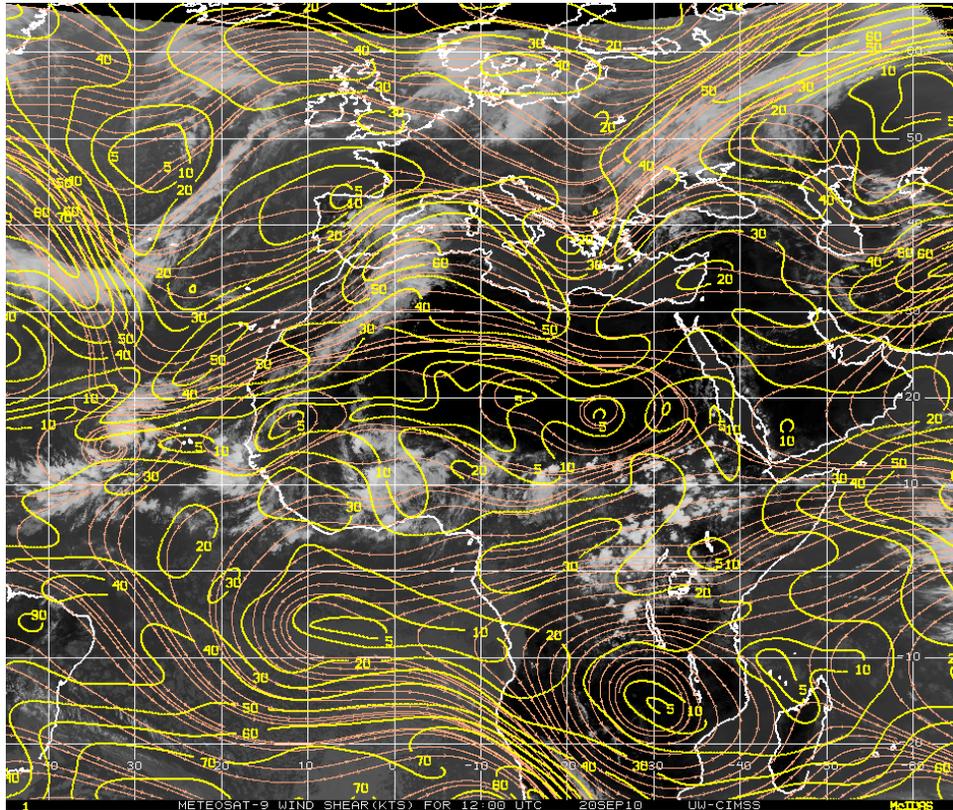
C6 Africa Lower Level Vorticity



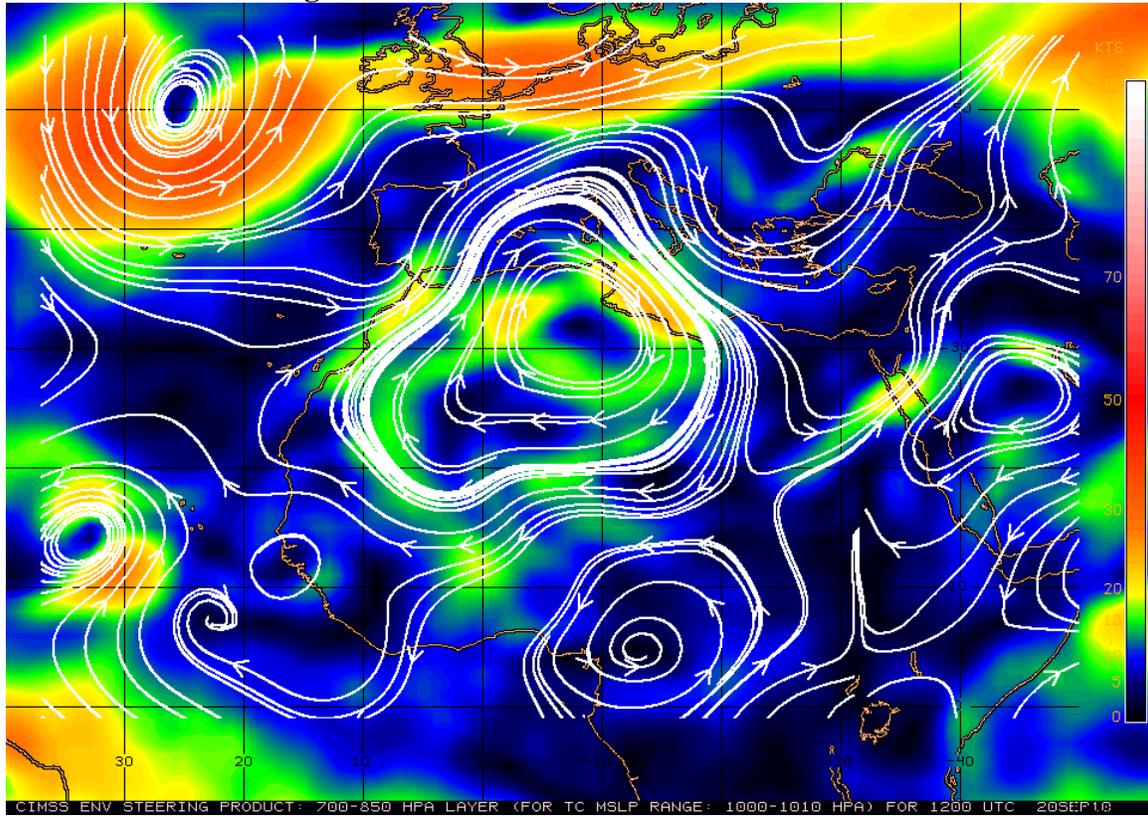
C7 Africa Lower Level Winds



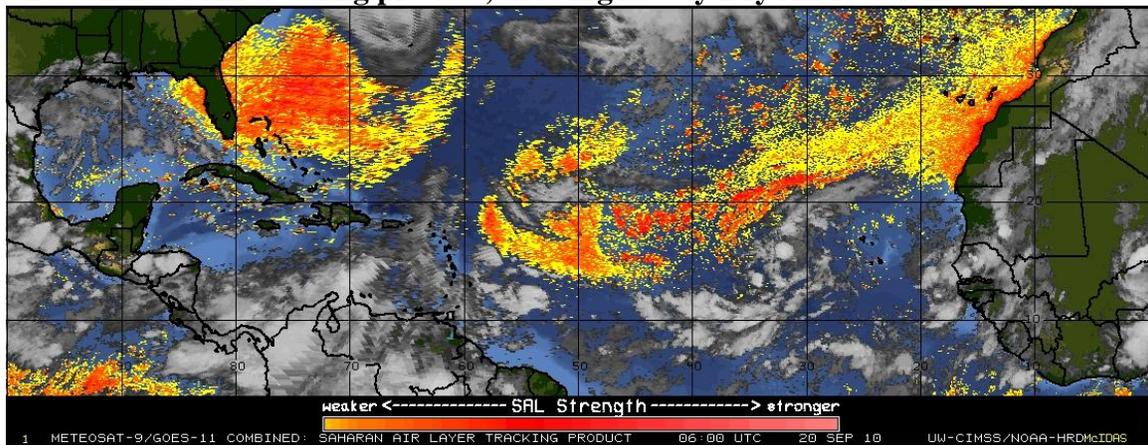
C8 Africa Wind Shear



C9 700-850mb Steering Flow over Africa



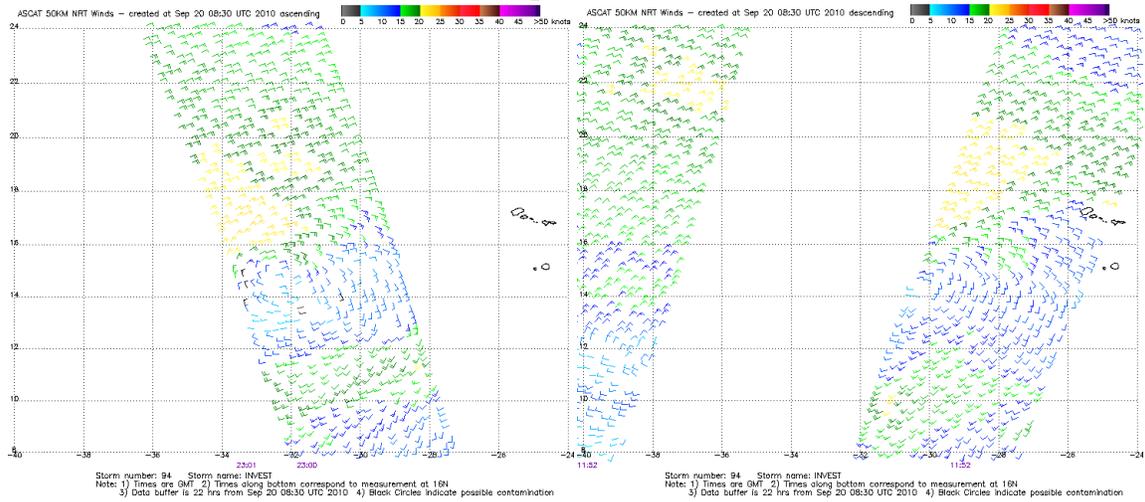
C10- CIMSS SAL tracking product, showing mostly Dry Air locations.



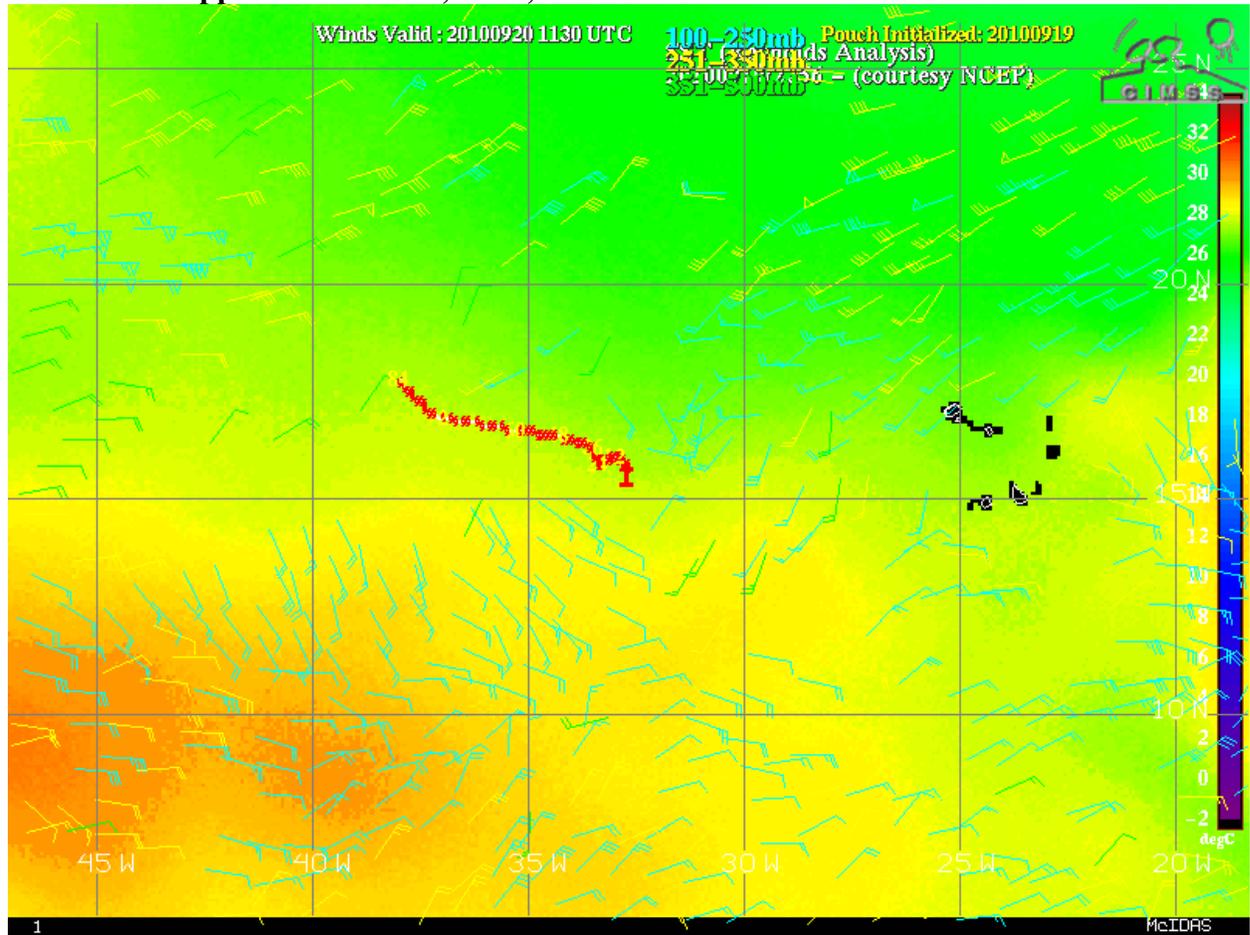
Features of Interest Images

PGI-45L:

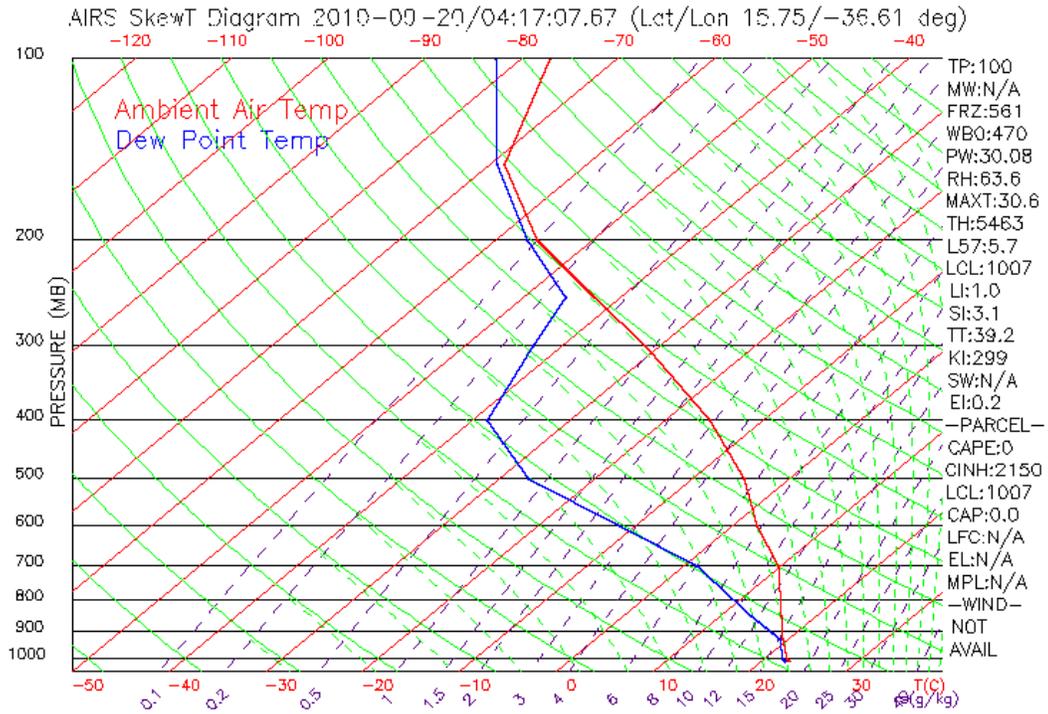
45A- ASCAT 0000UTC and 1200UTC passes



45B-CIMSS Upper Level Winds, SSTs, and Model Consensus Pouch Track

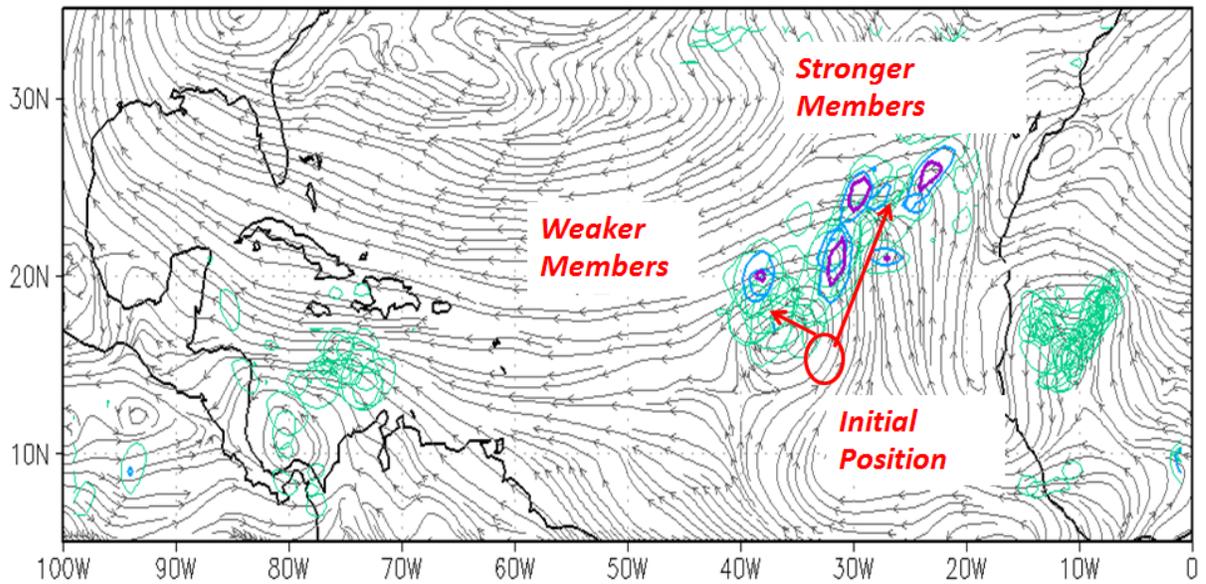


45C AIRS Skew-T NW of AL94 at 0417UTC



45D

Gray: NCEP 84-hour CTRL streamlines at 850 hPa. Init. 2010092000, Valid 2010092312.
 Color: Spaghetti contours of ZETA x 5e-5 s^-1 and OW x 2e-9 s^-2. 20 members.

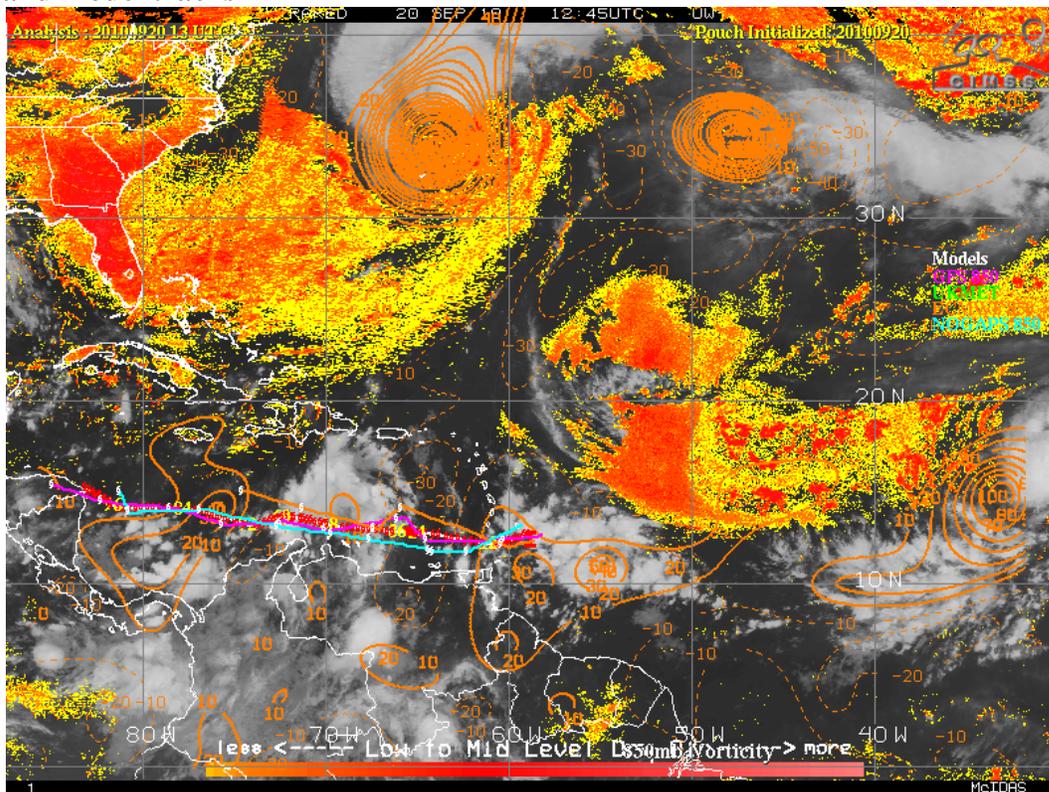


PGI-46L:

46A- Caribbean IR image from 1215 UTC 20 September 2010



46B- CIMSS PGI-46L Model Products 20 September 2010; 850 hPa RVOR, SAL and model tracks

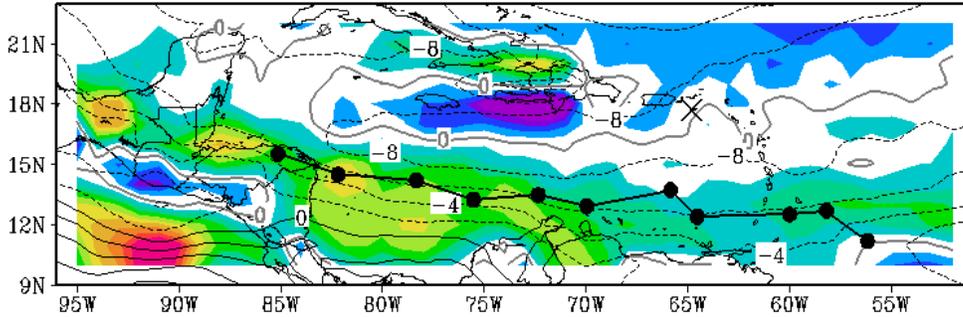


46C- GFS pouch forecast initialized 20/0000UTC for PGI-46L

PGI46L: 5-Day Forecast Based on GFS

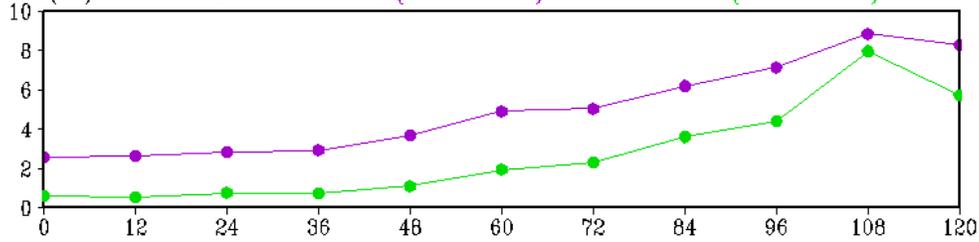
Initialized at 2010092000

(a) Track, 850 hPa U and Zeta (5-day average)

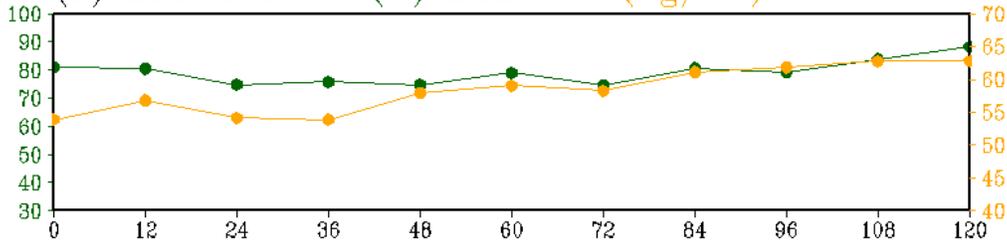


3x3 degree box averages following the pouch:

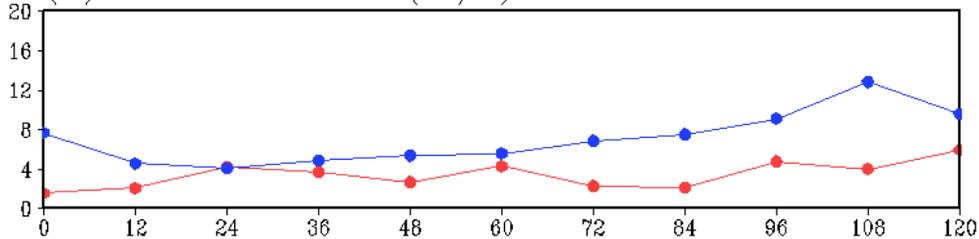
(b) 850 hPa Zeta (10^{-5} s^{-1}) and OW (10^{-9} s^{-2})



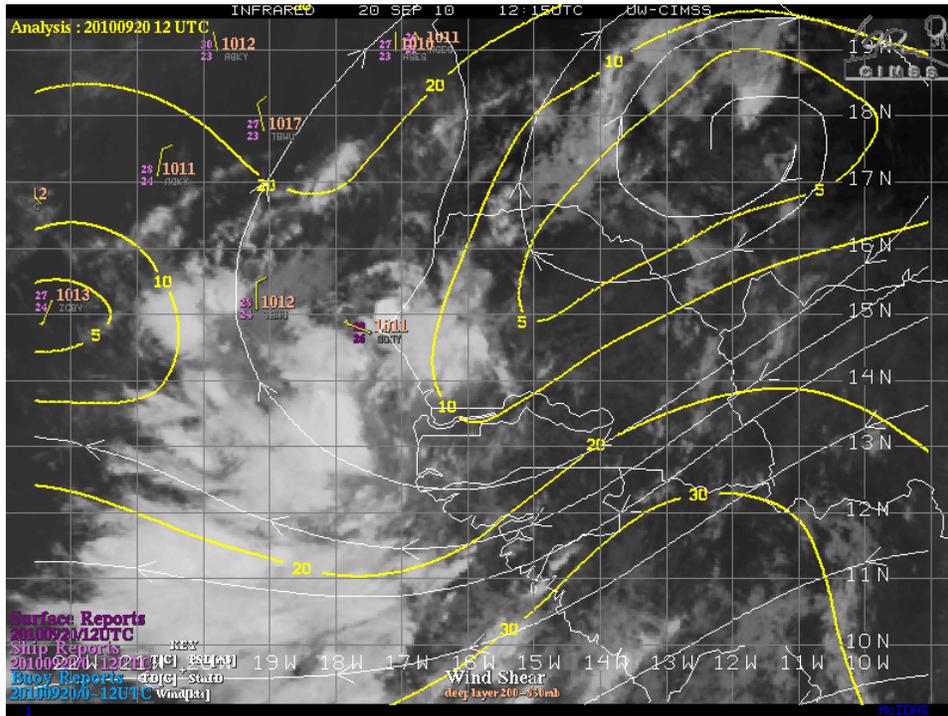
(c) 850 hPa RH (%) and TPW (kg/m^2)



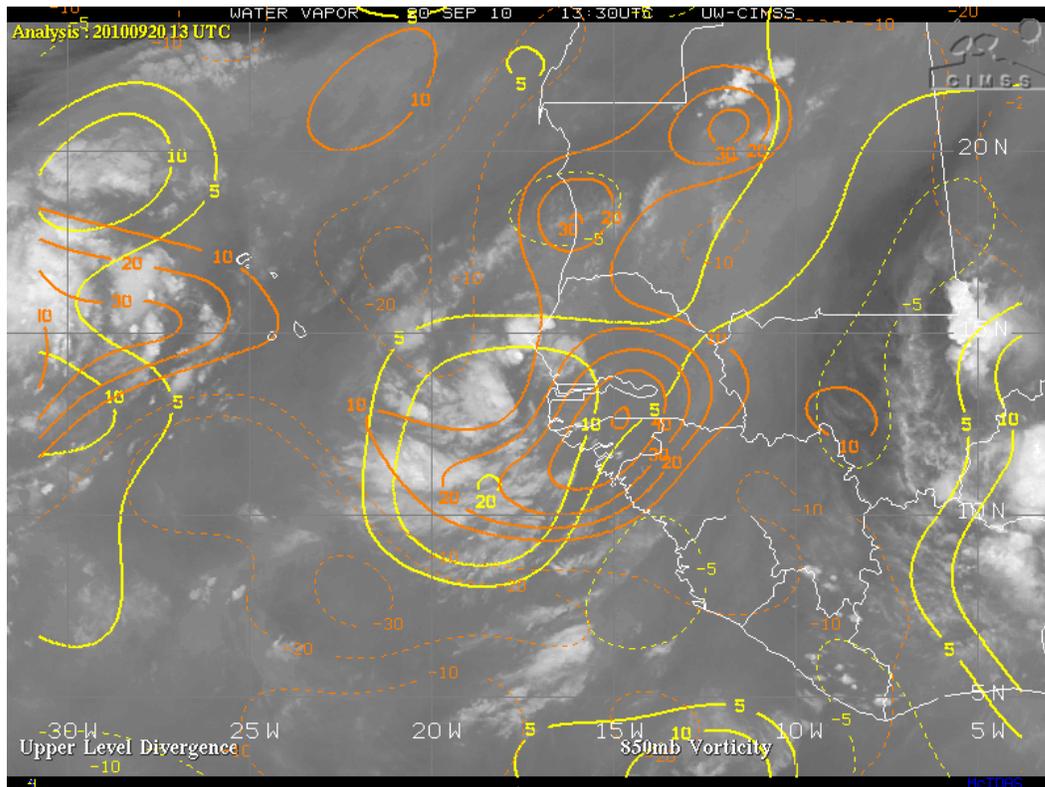
(d) Vertical shear (m/s)
 Deep 200-850 hPa
 Pouch 500-850 hPa



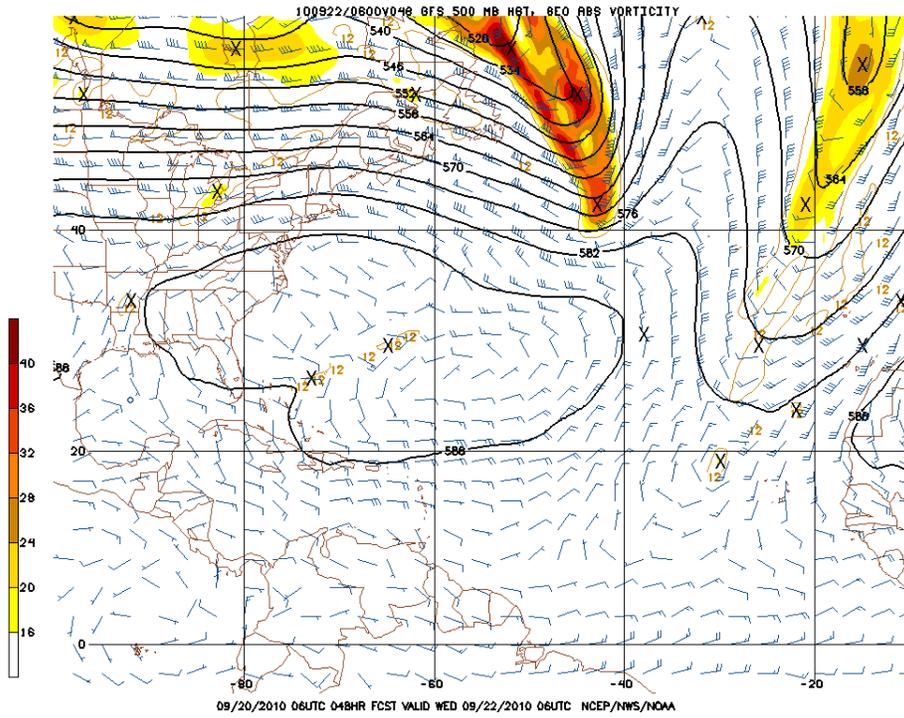
PGI-47L:
47A: CIMSS Shear and IR



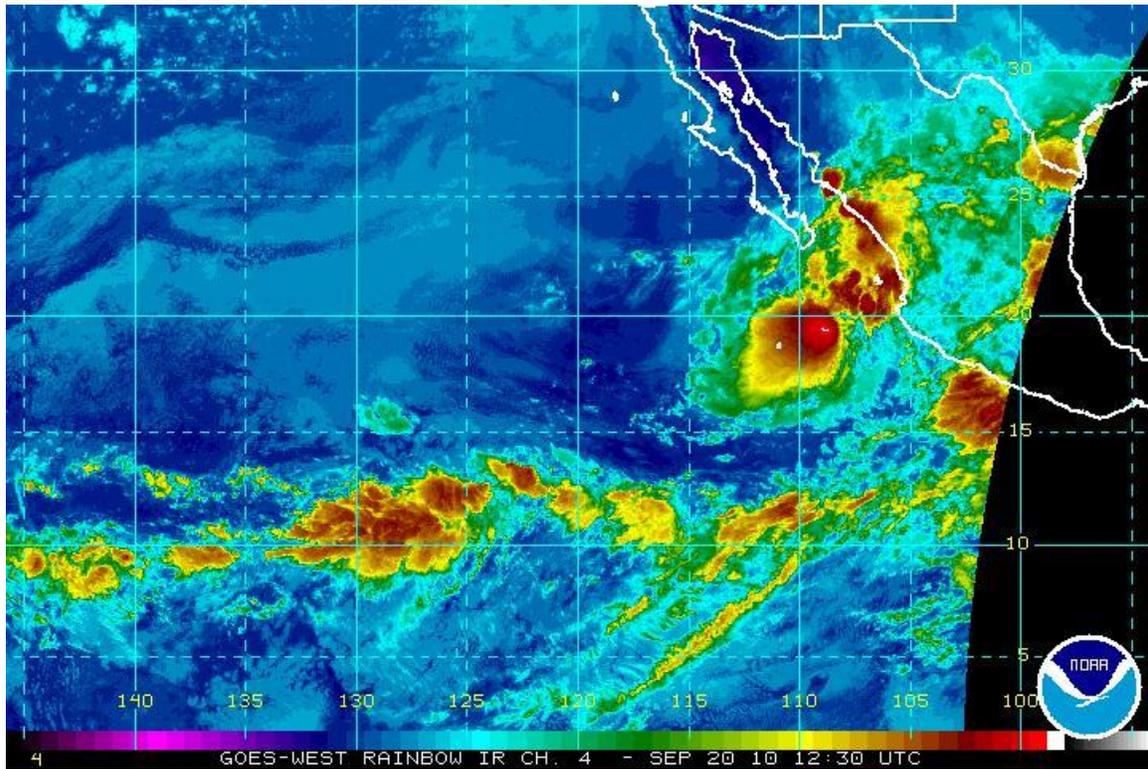
47B: CIMSS Vorticity, Upper-Level Divergence, and WV



47C: 9/20/06UTC 500 hPa Height and Vorticity GFS 48-hour Forecast

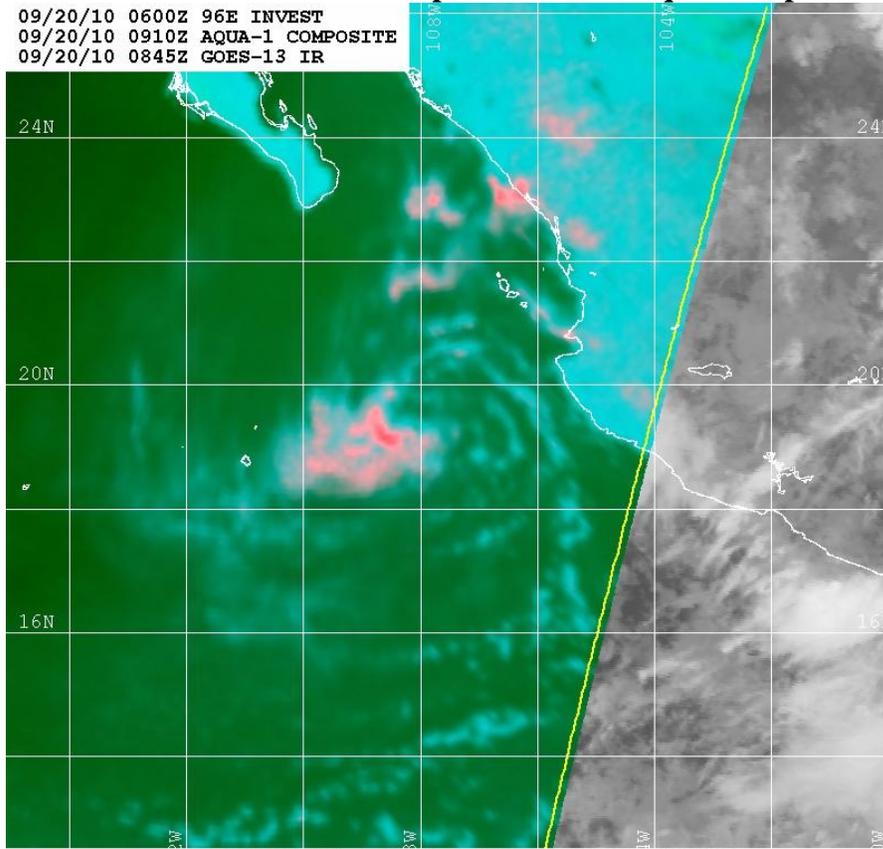


East Pacific Invest 96E:
96E1- NOAA SSD East Pacific Infrared



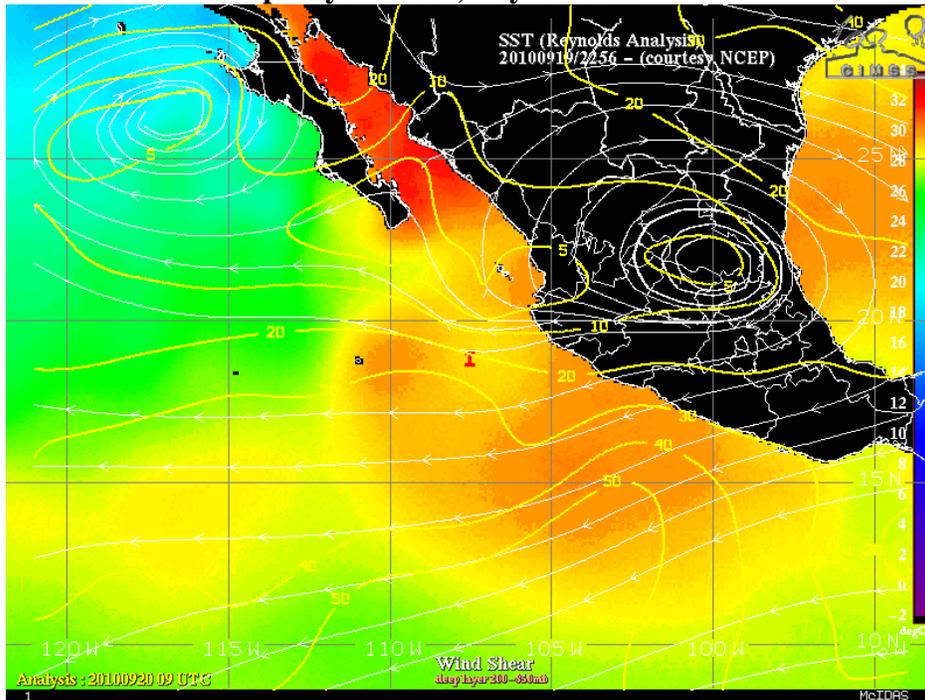
96E2 – NRL 36GHz Color Composite from 9z Aqua Overpass

09/20/10 0600Z 96E INVEST
09/20/10 0910Z AQUA-1 COMPOSITE
09/20/10 0845Z GOES-13 IR



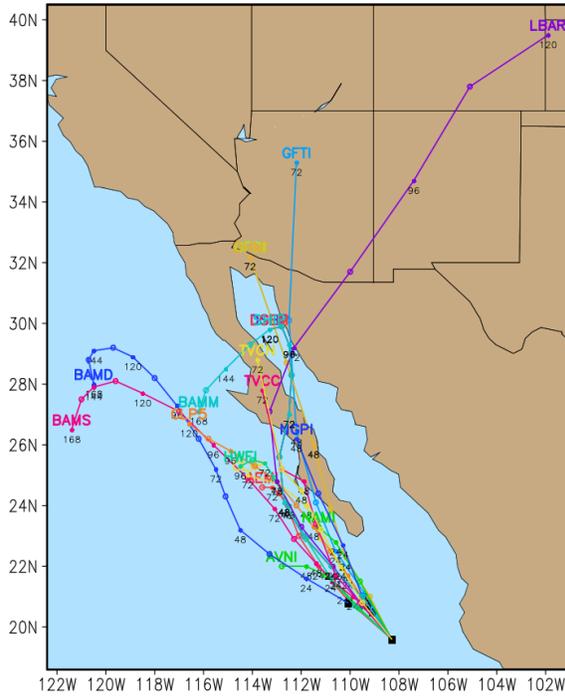
Naval Research Lab www.nrlmry.navy.mil/sat_products.html
Red=36PCT Green=36V Blue=36H

96E3 – CIMSS Deep Layer Shear, Reynolds SST



96E4 – 12z Model Track Forecasts

E. Pacific INVEST 96 Model Tracks
Valid Time: 1200 UTC 20 September 2010



MODELS
DISPLAYED

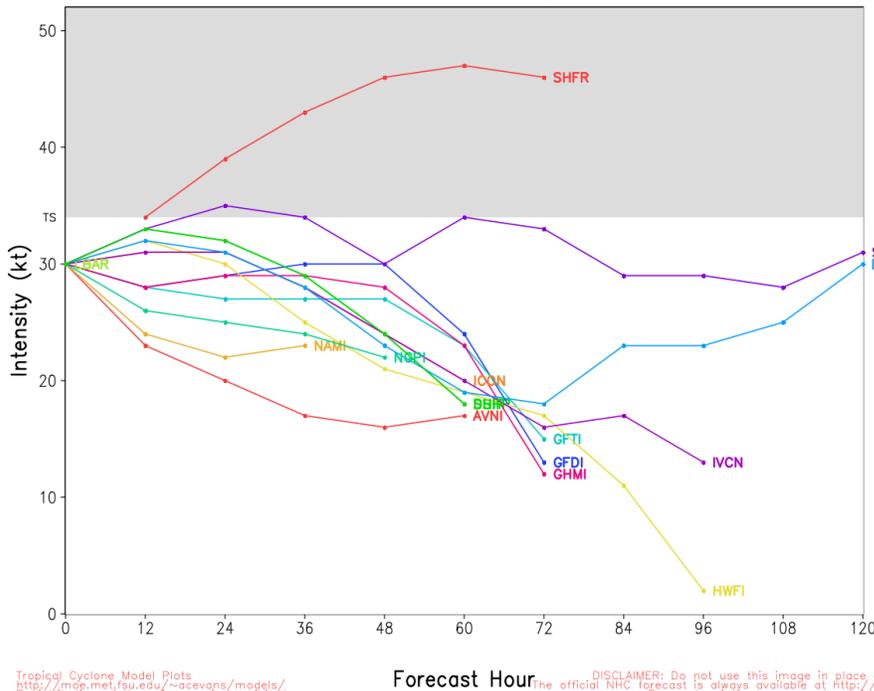
- AEMI
- AVNI
- BAMD
- BMM
- BAMS
- CLIP
- CLP5
- DSHP
- GFDI
- GFTI
- GHMI
- HWFI
- LEM
- LBAR
- LGEM
- NAMI
- NGPI
- SHIP
- TVCC
- TVCN

Tropical Cyclone Model Plots
<http://mpc.mel.fsu.edu/~acevans/models/>
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DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is always available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 12 hr increments. Initial points denoted by black squares.

96E5 – 12z Model Intensity Forecasts

E. Pacific INVEST 96 Model Intensities
Valid Time: 1200 UTC 20 September 2010



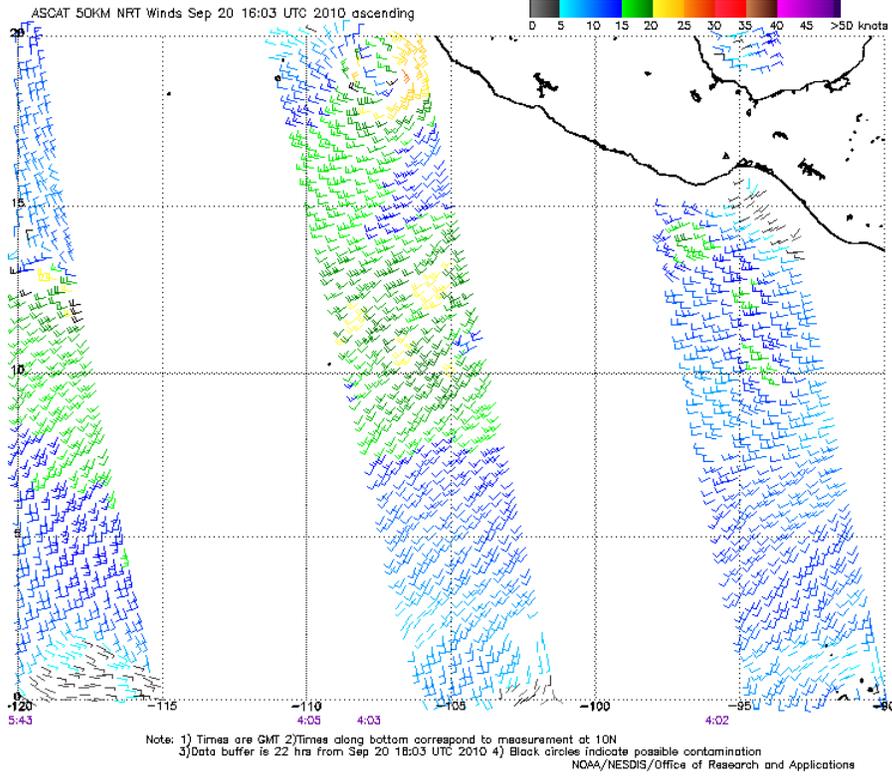
MODELS
DISPLAYED

- AVNI
- DSHP
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- HWFI
- ICON
- IVCN
- LBAR
- LGEM
- NAMI
- NGPI
- SHF5
- SHFR
- SHIP

Tropical Cyclone Model Plots
<http://mpc.mel.fsu.edu/~acevans/models/>
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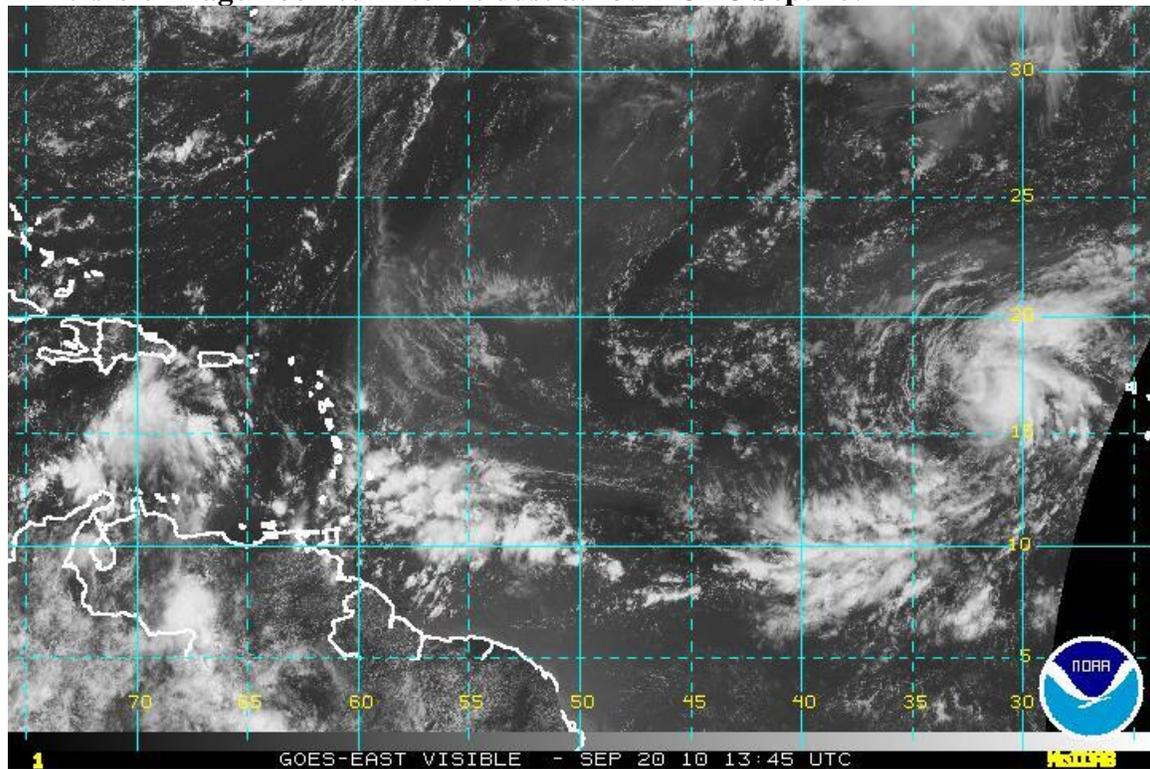
DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is always available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 12 hr increments.

96E_5: ASCAT pass over 96E6/Ex-Karl:



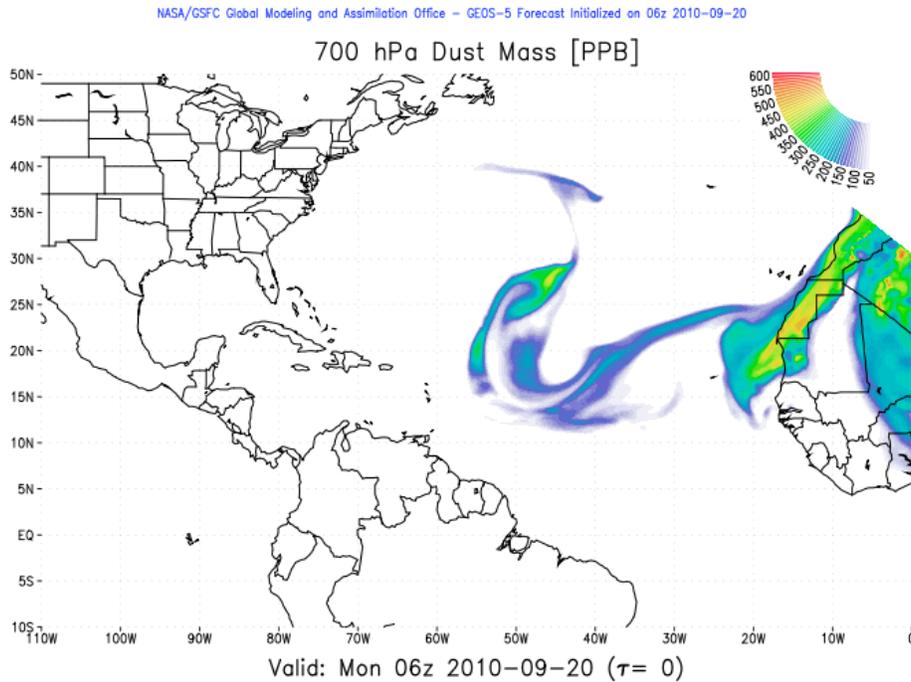
Dust/SAL

D1- Visible Image Zoomed in to the dust at 13:45 UTC Sept 20:

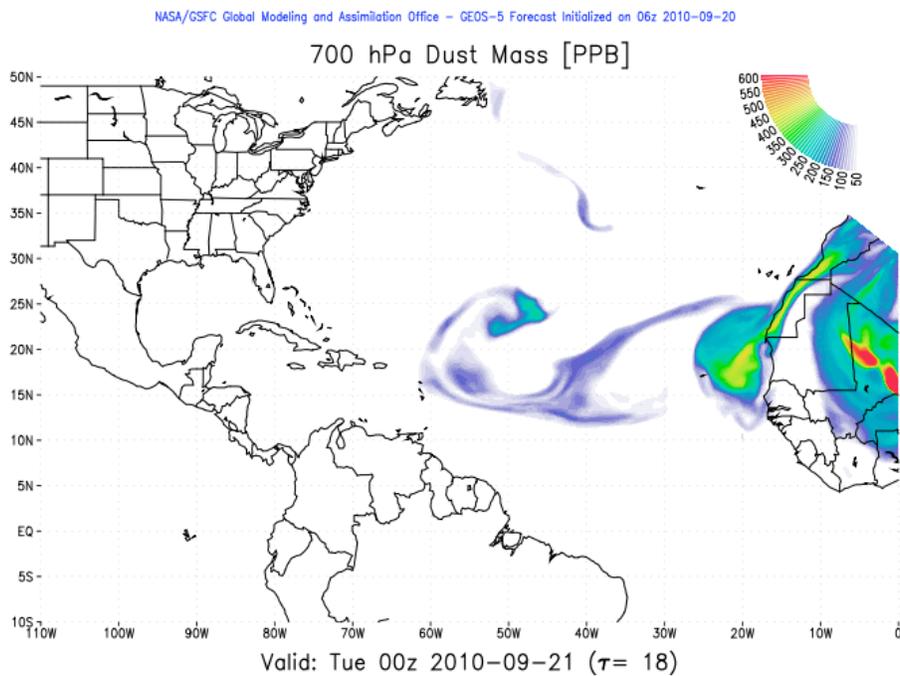


D2- GEOS-5 700 hPa Dust Analysis for Sept 20 at 0600 UTC (A), followed by 700 hPa forecast at 0000 UTC Sept 21 (B), 1800 UTC Sept 21 (C), and 0000 UTC Sept 22 (D):

(A) 700 hPa analysis at 0600 UTC Sept 20:

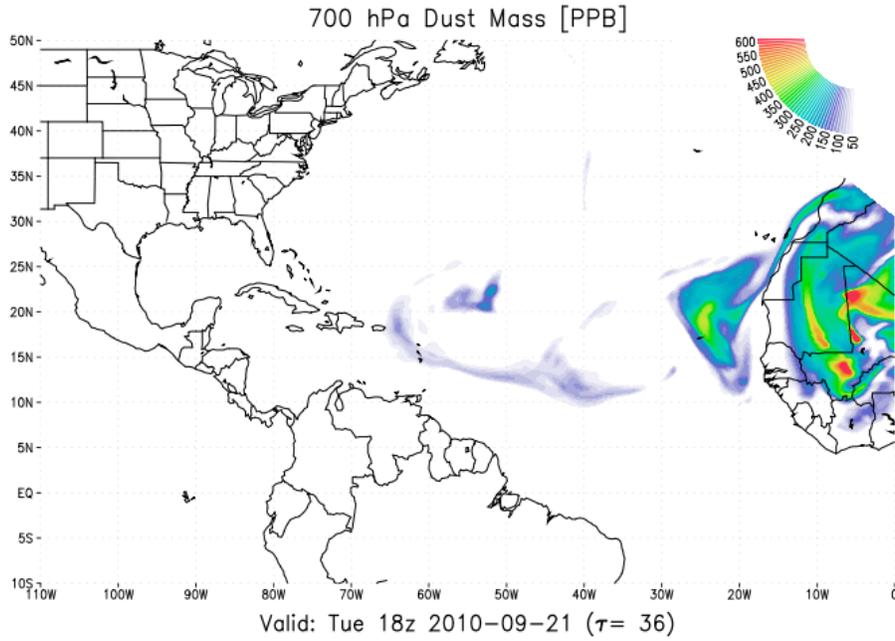


(B) 700 hPa FORECAST at 0000 UTC Sept 21:



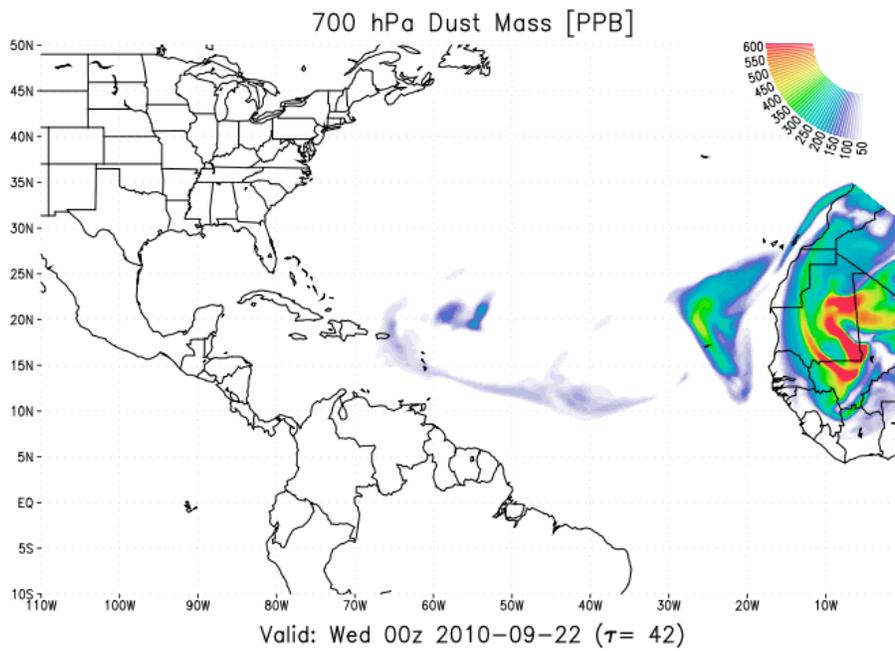
(C) 700 hPa FORECAST at 1800 UTC Sept 21:

NASA/GSFC Global Modeling and Assimilation Office - GEOS-5 Forecast Initialized on 06z 2010-09-20



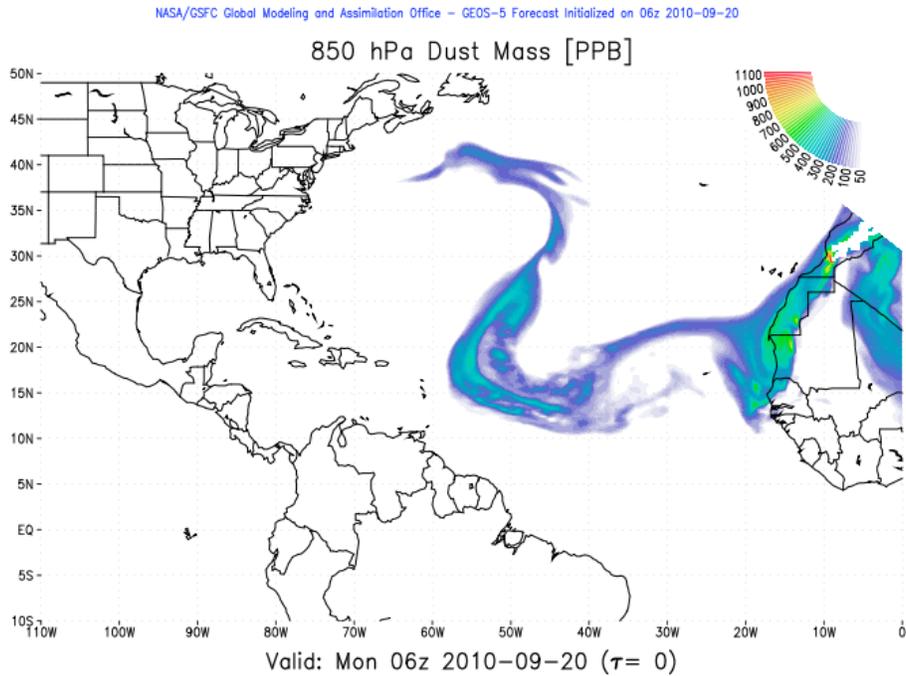
(D) 700 hPa FORECAST at 0000 UTC Sept 22:

NASA/GSFC Global Modeling and Assimilation Office - GEOS-5 Forecast Initialized on 06z 2010-09-20

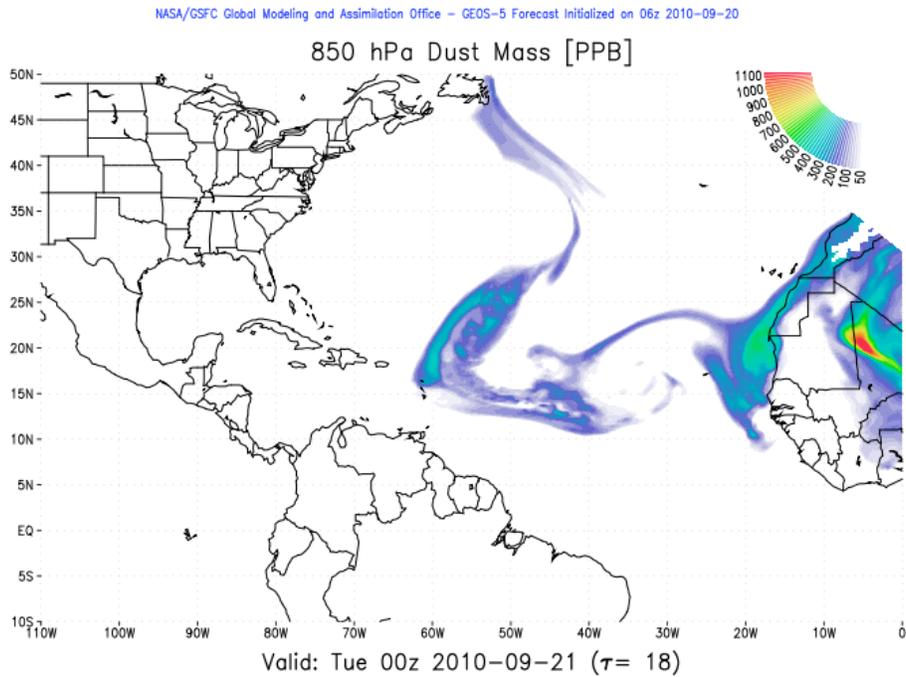


D3- GEOS-5 850 hPa Dust Analysis for Sept 20 at 0600 UTC (A), followed by 850 hPa forecast at 0000 UTC Sept 21 (B), 1800 UTC Sept 21 (C), and 0000 UTC Sept 22 (D):

(A) 850 hPa ANALYSIS 0600 UTC Sept 20:

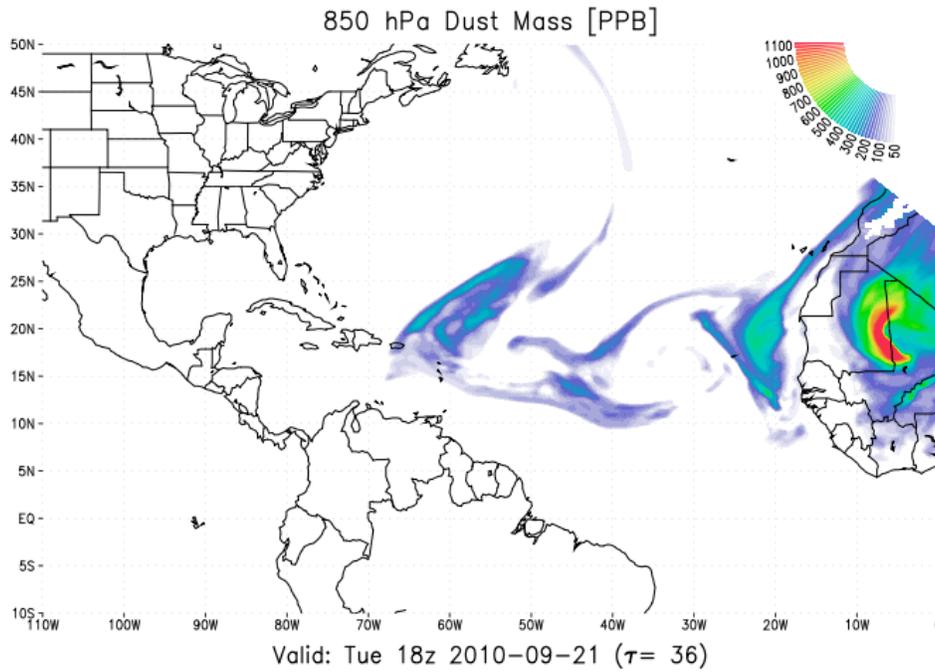


(B) 850 hPa FORECAST 0000 UTC Sept 21:



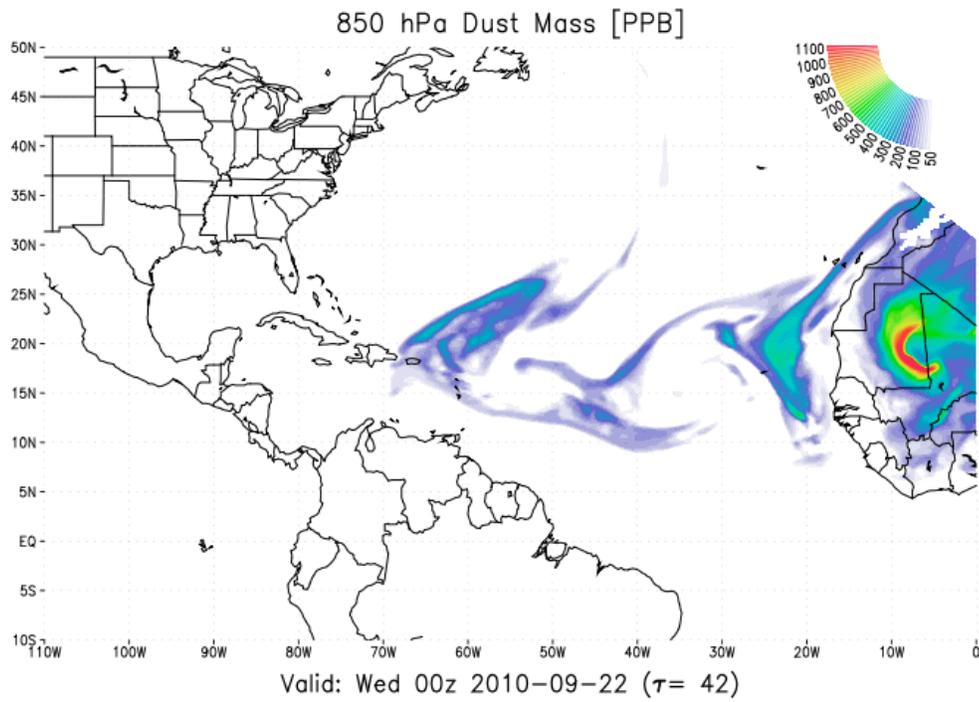
(C) 850 hPa FORECAST 1800 UTC Sept 21:

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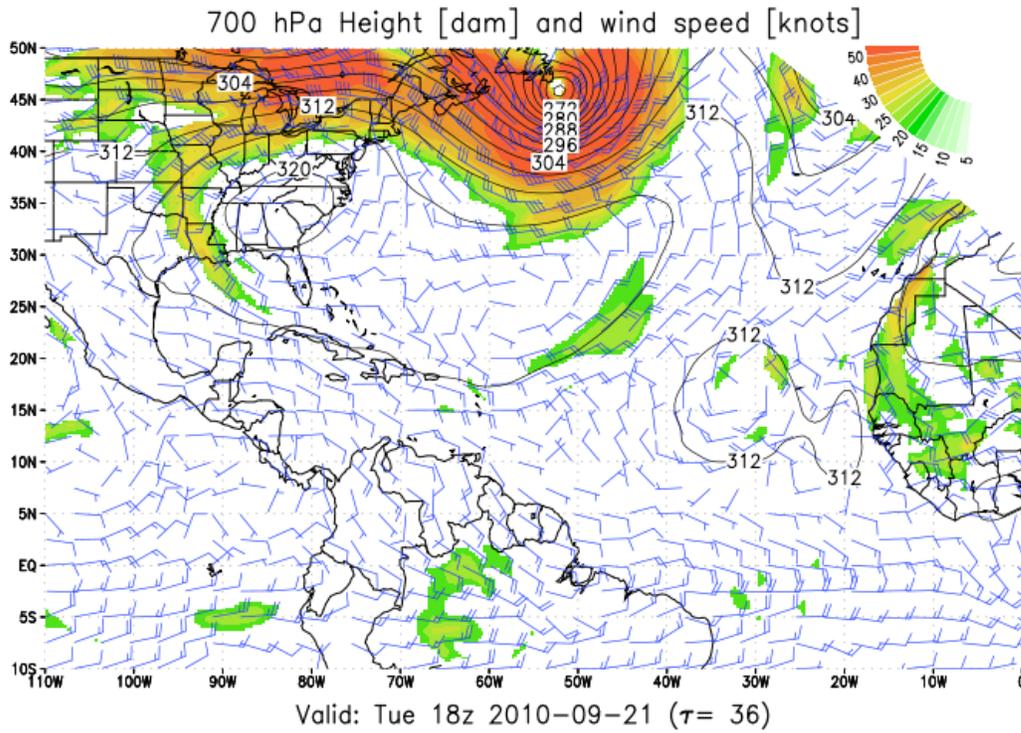
(D) 850 hPa FORECAST 0000 UTC Sept 22:

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D4- 700 hPa WIND forecast for flight target: dust region at 1800 UTC Sept 22

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D5- 850 hPa WIND forecast for flight target: dust region at 1800 UTC Sept 22

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